THE MEDICAL JOURNAL OF AUSTRALIA

VOL. I.—35TH YEAR. SYDNEY, SATURDAY, JUNE 12, 1948. No. 24.

Table of Contents.

[The Whole of the Literary Matter in THE MEDICAL JOURNAL OF AUSTRALIA is Copyright.]

ORIGINAL ARTICLES— Page.
Other Ways of Doing Things, by A. A. Abbie 725
The Diagnosis of Fallot's Tetralogy and the Rationale of its Surgical Treatment, by Malcolm N. Allen 729
Surgical Treatment of Fallot's Tetralogy, by C. J. Officer Brown 731
Anæsthesia in the Surgical Treatment of the Tetralogy of Fallot, by R. H. Orton 733
Corneal Transplantations, by Peter B. English and J. McBride White 736
A Note on the Royal Army Medical Corps, by A. M. McIntosh 738

REVIEWS—
Eye Nursing in Children 740
A Textbook of Surgery 740
Medical Treatment 740

LEADING ARTICLES—
The Investigation of Metabolism 741

CURRENT COMMENT—
Recurrent Pancreatitis 742
The Prevention of Tetanus 742
The Treatment of Leprosy 743

ABSTRACTS FROM MEDICAL LITERATURE—
Gynæcology 744
Obstetrics 745

BRITISH MEDICAL ASSOCIATION NEWS—
Scientific 746

CORRESPONDENCE— Page.
A Basic Routine for Post-Operative Treatment after Laparotomy 747
Re 100% Failure in Part I D.D.R. 747
Mortality from Acute Appendicitis 747
The Meeting of the Federal Council 748
Anne MacKenzie Oration: Hunter's Advice to Jenner 748
Diagnosis of Gastric Disease: Should Radiology of the Stomach be Abandoned? 748

NAVAL, MILITARY AND AIR FORCE—
Appointments 750

OBITUARY—
Herbert Huff Johnston 750
Hugh Corbett Taylor-Young 751
Richard Ryther Popplewell Steer Bowker 751
Vincent Wellesley Savage 751

A MEMORIAL TO DR. VERA SCANTLEBURY BROWN 751

THE ROYAL AUSTRALASIAN COLLEGE OF SURGEONS—
A Post-Graduate Course in Surgery 751
Gordon Craig Scholarships 751

AUSTRALIAN MEDICAL BOARD PROCEEDINGS—
New South Wales 751
Queensland 752

NOMINATIONS AND ELECTIONS 752
MEDICAL APPOINTMENTS 752
BOOKS RECEIVED 752
DIARY FOR THE MONTH 752
MEDICAL APPOINTMENTS: IMPORTANT NOTICE .. 752
EDITORIAL NOTICES 752

OTHER WAYS OF DOING THINGS.[1]

By A. A. ABBIE,
Department of Anatomy, University of Adelaide.

> Let us always, and in all that we say, hold that God made them as far as possible the fairest and best, out of things which were not fair and good.
>
> —PLATO.
>
> The highest art goes straight to its end without deliberation.
>
> —ARISTOTLE.

WHILE the earth is probably some 2,000,000,000 years old, it has supported living things for only about half that time. As the ages passed the tiny spring of life which first appeared swelled to a stream, a river, an ocean and, finally, a vast flood, which has burst over every habitable part of the globe. That flood contains many currents—some fast, some slow, some narrow and tenuous, others broad and massive. Since the beginning many of the mightiest currents have vanished silently and mysteriously, others have dwindled to a tiny trickle; only a few have advanced upon an ever-widening front down to the present day, and amongst these we number that which leads to man. But within the living flood no part is more important to the total scheme than the rest; all life is one—human as well as any other. Moreover, what we take for individuals are just waves and eddies, crystallized in temporary independence before sinking back once more. Individuals are but accidents, for we cannot tell who will mate with whom, or by what chance one of many millions of sperms will fertilize one of many possible ova. Life is a unity in which the individual is no more than a minor condensation of living matter held in coherent form for a brief fraction of time.

[1] Inaugural address to the trienniel congress of the Australian Physiotherapy Association, Adelaide, March 1, 1948.

Since life is one and is everywhere subject to the same requirements, all forms of life inevitably respond in much the same way to similar problems posed by the environment around. Occasionally, no doubt, the problem and its solution were unique, for the face of the earth is wide and varied. More often the same problem was encountered by many diverse kinds and was solved by each in its own fashion, but to a comparable end. Sometimes similar problems were posed and solved more or less contemporaneously in different parts of the earth. Not infrequently, however, the same problem has been encountered over and over again by successive waves of life, each more complex than its predecessor, and has been solved at successively higher grades of organization, all fundamentally alike. The essentials of life are relatively few, and such is the drive of living matter that it will secure those essentials, by the use of no matter what materials, to ensure survival and continuance.

Innumerable examples of this fact are evident in biological records, and it is salutary to take a brief glance at some of them—without, however, pretending to do justice to the amazing adaptability which living matter displays in its struggle for existence. I can, for example, draw attention to the independent development of gills for respiration in such unrelated animals as crabs and fishes, or compare the lung-like apparatus in snails with that in terrestrial vertebrates. Or, again, the mammalian upper larynx, developed in the neck—according to Negus—because of the necessity for fixing the forelimbs, and later adapted to the production of sound, may be compared with the syrinx of birds—a similar sound-producing organ, but developed in the lower larynx. Even more striking is exploitation of the air above—by parachute in such diverse groups as spiders, fishes, frogs, reptiles, marsupials and eutherians, or by wings of dissimilar structure in insects, pterodactyls, birds and bats. It is of particular interest to us in Australia that marsupials afford one of the best examples of how a restricted group of animals can exploit practically every possible economic niche, producing,

meanwhile, structural adaptations closely similar to those independently evolved by totally unrelated animals under similar conditions elsewhere. Thus, we have our pouched "mice", "rat" kangaroos, a marsupial "mole" and an anteater, the native "cats", the Tasmanian "wolf", the native "bear", and so on.

The most important single factor perpetuating and swelling our 1,000,000,000 year old flood has been the attention paid to reproduction. The primitive method of discharging germ cells broadcast to be fertilized by chance is exceedingly wasteful and barely achieves its object. So, quite a number of very different kinds of animals have adopted internal fertilization—some such being earthworms, snails, insects, some fishes, and all reptiles, birds and mammals. This ensured more certainty in fertilization; yet greater security was achieved by parental care of the progeny for a shorter or longer period after production. Such attention may amount to no more than the provision of a nest for protection during the most helpless period, as in, say, wasps, spiders, some fishes, some reptiles, birds and the monotremes. Other types of animals go further and provide temporary harbourage within the body of the parent—for convenience, usually that of the mother. The most primitive type of harbourage is secured by implanting the newly deposited eggs or young in a pouch on the surface, as in some fishes, many amphibians, the echidna, and in part in marsupials. Finally, complete internal harbourage is secured by the retention of the progeny within the mother's body beyond the ovum stage and well on into subsequent development. This has been approached by the marsupials and is particularly characteristic of the true, or eutherian, mammals. However, this device, which clearly affords the most efficient method of perpetuating the species, had been independently evolved by some sharks and rays, and later by some reptiles, many millions of years before the mammals appeared on earth.

By this time, no doubt, you are beginning to wonder what part this elaborate preamble—however interesting to the general biologist—plays in your dealings with a single animal, man. At the outset the connexion may seem remote, but I would remind you that in dealing with man you are dealing with a part of Nature; you are, whether wittingly or not, applied biologists, and you cannot remain completely indifferent to any aspect of biology. My main purpose, however, has been to impress upon you that the whole substance of the biological world is a single material, passing in constant ebb and flow through all the manifestations that life assumes. In whatever guise living matter appears its requirements are the same, and its ends are secured by adaptations which all attain the same functional result, even if they are sometimes dissimilar from the structural and evolutionary points of view. Nature has many ways of doing the same thing. Some are superior to others, or evolution would have no meaning; but we may fairly assume that those other ways of doing things that I have briefly reviewed have all proved tolerably successful.

These principles apply equally to man, the sole object of your professional attention. It is true that man is only one kind of animal, but he is subject to the same influences as any other. Moreover, while man is but a single animal, he is far from being a unity, even within the individual. He is, on the contrary, a mosaic of competing interests all held in only relative harmony within the rather loose framework of his general body pattern. The mosaic is determined by his genetic make-up, and it is normally manifest in the differential development of all his potentialities, such as secure the distinction of male from female, individual from individual and, say, "typical" European from "typical" Chinese. This becomes of practical importance when some part of the mosaic blunders or fails at on early stage, to result in, perhaps, a "lobster-claw" hand, a missing extremity or a deformed skull; or when it fails late in life so that, for example, the brain, the kidneys or the heart gives way to destroy the remainder of the body.

There is another way in which our principle applies especially to man. In the vast majority of other animals the possible number of responses to any particular situation is relatively limited; many animals, indeed, are little more than automata over a wide range of daily activity. Man, an the other hand, more than any other, has the capacity to vary his muscular responses to meet variations in external conditions. Such capacity depends, of course, upon both a deeper intellectual appreciation of the situation and a motor mechanism under exquisite control. This does not contradict the general observation that mankind *en masse* tends to behave like a flock of sheep, but it does mean that most human individuals contain the possibility of a great number of alternative solutions to any given problem. Certainly, in most this possibility is potential only, and unrealized; but it exists, and it permits the more enlightened consciously and deliberately to experiment with other ways of doing things.

As you know, the human infant is born endowed with only the relatively simple reflexes necessary to its state of development—blinking, sucking, bladder and bowel reflexes, and so on. The great motor pathways, the pyramidal tracts, are immature—the fibres lack their myelin sheaths and are virtually functionless. Myelination starts, however, and by about the third month the infant can hold up its head and move its arms, by the sixth to ninth month it can sit up, and by the twelth month it will be crawling, if not trying to stand and walk. Myelination of the pyramidal tracts is not completed until about the eighteenth to twenty-fourth month, and by that time the possibilities of conscious direction extend to practically every voluntary muscle in the body. Man is probably uniquely slow in myelination of the pyramidal tracts; but he is probably equally unique in the widespread and minute control the process ultimately secures. At the second year, however, such capacity is largely potential; a few possibilities are on the way to realization in the activities I have mentioned, but much more must be achieved before the child can play an independent role in the daily round of life. The human infant is born with less inherent motor capacity than any other animal, and it must learn, often with much labour, even such elementary things as how to stand, walk and run, use its hands and talk. More complex behaviour such as dancing, skating, swimming, singing, playing musical instruments *et cetera* is acquired later and usually with even greater labour. The necessity to learn every useful activity of life is both man's weakness and his strength. On the debit side it leaves him helpless and dependent upon others for a number of years; on the credit side it opens the way to almost unlimited possibilities in the way of muscular performance.

It is of interest to follow this learning process—so supremely characteristic of man, although not unique to him—a little more closely. What does it really imply? In the case of man, at least, it implies a definite appreciation of the purpose to be achieved by a particular activity. In the infant control of the hands brings the unattainable within reach, walking promises an independent mobility that must be exceedingly attractive, and speech lends precision to the communication of requirements. The stimulus to learning is the desire to achieve a purpose, the means is a movement intellectually conceived of as a whole. Example gives an outline of the pattern and a continual process of trial and error secures a practicable sequence of muscular contractions and relaxations integrated within a whole movement which approximates to the intellectual ideal. The muscular sequence finally settled upon is that which attains the objective, but it is not necessarily the best possible sequence nor is it necessarily the same sequence as others use. Each individual achieves only the best available within the limitations of his intellectual capacity and muscular possibilities. That is why we hire sports coaches who undertake to teach us the absolutely best way of doing things.

At all events, most of the biological activities essential to the daily round of life are acquired in this fashion during the first two or three years—in the dim dawning of mind into which memory rarely penetrates. For memory carries us back only to the time when we already possess considerable muscular skill; it takes this as a natural heritage, and gives but little hint of the labour, frustrations and triumphs which have accompanied acquisition of that skill. Only in later life, when we try

to integrate a series of muscular activities within the framework of a desired movement (such as swinging a golf club) do we come to appreciate the work entailed in mastering even the simplest motor behaviour—although, of course, some learn more quickly than others and the young learn best and fastest of all. In the acquisition of a muscular activity, then, the major stimulus is the desire to attain a purposive end; the actual muscles employed are only more or less the same as those employed by others towards the same objective. The important thing is the end; the means is a matter of indifference so long as it is successful.

This is what Hughlings Jackson meant when he said that the mind is concerned only with movements, not with muscles. The same point has recently been emphasized by Walshe, but it does not express the whole truth. What the mind actually conceives of depends upon the extent to which it has been educated. The vast bulk of mankind is concerned only with the movements biologically necessary to daily life—with the addition, usually, of some other muscular skills required for work or sport. These minds think only of useful or desired movements because they have never entertained the idea of anything else. But much more is possible, as every little boy who can "wiggle" his ears or abduct his little toes demonstrates. And it is interesting to compare the dull motor plodder with him who enjoys the brisk pleasure of his rippling muscles. In fact, intelligent and well-informed athletes possess a very detailed awareness of the muscular possibilities of their bodies, and in proportion to this awareness they can and do, by concentration and practice, gain conscious control over individual muscles or even parts of muscles. The dictum of Hughlings Jackson, then, is true only in a general sense; it makes no provision for those whose education or intellectual appreciation extends to fractions of movements or to single muscles. My own experimental observations, and those of many others, show that some capacity for the cortical control of individual muscles is already present in quite simple mammals, and this capacity crystallizes into progressively finer detail as we ascend the evolutionary scale. Jackson's view sets to muscular control a limit which does not really exist, for indeed we are at present only dimly aware of our ultimate possibilities in that direction.

We have already noted that the essence of motor activity is an intellectual conception of the complete movement; now we may pursue this aspect of the problem a bit further. As you know, purposive motor activities may be quite impossible despite the fact that all the neuro-muscular mechanisms directly concerned are intact. Such purposive defects depend upon loss of the mental conception of the complete movement, even in the face of strong desire and an effector system which functions perfectly in other activities. Disorders of this kind are called apraxias. The victims may be able to scratch themselves but are unable to write (agraphia) or they can lick their lips, swallow, cough or even laugh without being able to speak (motor aphasia, aphemia). Here the nervous circuit concerned has lost what is—especially for man—an essential component, the painfully learned conception of the movement as a whole. This again is an example of man's weakness and strength; he has traded the more robust stereotyped motor mechanisms of simpler brains for the delicately poised capacity for infinitely varied response, and when this fails there is virtually nothing to take its place.

This brings me to the point where I may conveniently discuss the question of "handedness". As you well know, the vast majority of people prefer to use the right hand for most activities; the bulk of the remainder are as strongly wedded to the left hand. "Handedness" is a comparatively recent evolutionary acquisition and even in man is not yet definitely restricted to one or other side. Human "handedness" has some hereditary basis; the bias is not particularly evident in the first few years of life, but it becomes confirmed as the pyramidal tracts mature and assume control. When the crossing of the pyramidal tracts is taken into account this means that the opposite cerebral hemisphere—usually the left—becomes dominant. In confirmation, Elliot Smith and Wood Jones found in a series of prehistoric skeletons that where the measurements of the superior extremities indicated right-handedness so did the skull show greater cranial capacity on the left. Thus the bias was sufficiently well established even in ancient man to produce measurable skeletal changes. "Handedness" confers a definite biological advantage on animals with any degree of conscious control—eliminating the delay of deciding which to use in emergency. It weds the merits of automatic response to the potentialities for infinite variability. And here it is interesting to note that Lord Lister, having mastered ambidexterity as a desirable aid to surgery, complained later that the accomplishment was sometimes a hindrance in requiring a decision as to which hand to employ. Clearly, "handedness" is of little benefit unless conscious control is very well developed; that is why the bias attains its maximum expression in man. However, the undoubted advantages which "handedness" confers have been secured at the cost of almost wholly excluding a complete hemisphere from participation in the intellectual side of motor, and possibly other activity. For it is practically certain that the intellectual conceptions of whole movements depend upon the activity of cortex in the dominant hemisphere just in front of the more frankly "motor" areas. This, at least, appears to be the case with such characteristic apraxias as agraphia and aphemia.

Without wishing to introduce too much complexity into this theme I may yet add that I feel that educationists have paid overmuch deference to "handedness" in the past. It was once the custom to compel left-handed children to write with their right hands—upsetting an already established dominance with such unfortunate results as stuttering and other motor conflict. The practice today is to permit children to write with whichever hand they prefer. It seems to me, however, that if children are encouraged to use the right hand early enough—say, at the second or third year, before the issue is decided—dominance becomes determined accordingly and right-handedness is gained without subsequent conflict and in the face of a contrary heritage. At all events, young children seem to be able to use either hand equally well at first and in this respect have two possible ways of doing things. And here I may repeat that all our basic skills of daily activity were acquired before the awakening of memory. We take them for granted. But you who deal with muscular disabilities must remember that the first few years of life are as important from the motor point of view as they are mentally to the psychoanalyst, and that any person over the age of four or five years must be treated as a well-established motor concern of relatively fixed cerebral dominance.

Finally, this aspect of our analysis demands some attention to vision. The lens of the eye, like any biconvex lens, reverses what is seen so that on the retina the top of the picture is below, the right side is on the left, and so on. This must be very puzzling to the young infant who tries to reconcile the topsy-turvy visual world with the contradictory impressions gained from direct contact and, especially, manual exploration. It is scarcely remarkable that the baby betrays lack of precision in responding to visual stimuli in the early days. In time, increasing familiarity with the external world through the other senses effects a mental readjustment whereby the child learns to "see" things the right way up, much as the experienced microscopist learns "automatically" to reverse all the movements of the object he is examining. Thus, we should not be surprised to find that children vary enormously in the speed and facility with which they learn to effect the necessary correction, or that some start by writing upside down or in mirror image—to the great distress of their parents and teachers. In the learning phase it is probably a matter of indifference to the child which way it writes, equally as—to judge by ancient inscriptions—it was a matter of indifference in the dawn of writing whether the letters faced right or left, or ran forwards or backwards, obliquely, or even up and down. Fixation of European writing our way up and from left to right is purely a learned convention; it might just as well have been the other way round. And it is quite easy to adopt the reverse

activity and learn to write in mirror image with the non-dominant hand, a fact which has been turned to some practical account, as I shall show.

You are fully alive to the fact that when some muscles fail others may be trained to take their place and effect an approximation to the original function. This is a routine of muscle reeducation, and if the nerve or muscle lesion was not too extensive it may achieve quite respectable success. The possibilities in this direction depend upon the fact, already emphasized, that the mind is concerned only with the end result, not with the means by which the result is gained. In other words, your aim is to show that there is another route to the same goal, and your success will necessarily depend upon the intellectual appeal you make in implanting the desire to learn a new way to an old end. For while such alternatives may be obvious to your trained mind, they are by no means obvious to a relatively conservative brain which for as long as it can remember has followed what seemed to be the inevitable and only conceivable way of achieving its object. The exercises you teach as an alternative will be of little value unless the mental drive is fully mobilized behind them. But if the desire is effectively implanted, and hope engages the intellect by showing the possibility of alternatives, then any suitable residual mechanism can be trained to serve in some measure as a substitute. It is true that some will learn better than others, but by and large the possibilities in this direction are pretty wide and have certainly not been fully exploited.

You must have seen armless people who have learnt to write by holding a pen with the lips or toes. They often achieve quite amazing facility in a number of activities—writing, drawing, painting, typewriting, playing musical instruments, and so on. They illustrate further my contention that it is the end not the means that counts, and that the mental urge may drive them to employ the most unlikely mechanisms. In this connexion it is of interest to note that some observers have claimed—but with what truth I cannot say—that the "handwriting" of individuals is the same whether written by hand, mouth or foot, thus reflecting the single intellectual conception behind the performance. I can affirm from personal experience, however, that the writing by either hand, no matter whether forwards or in mirror image, is virtually identical. And this brings to mind an interesting device introduced during the 1914–1918 war to help servicemen who had lost their right arms or hands. Naturally, the first desire of these unfortunates was to reassure their relatives by writing in person, for that carries more conviction than anything else. Therapists found that it took quite a long time to train people to write forwards with their left hands, but that in no time at all they could learn to write in mirror image. The patients, then, were allowed to write their own letters in mirror image, but with a dry nib or steel point on the back of the paper; facing the front of the paper was a sheet of carbon which recorded the message the right way round—and in the patient's own handwriting. Thus an alternative was quickly achieved, and there can be little doubt that the satisfaction engendered by this early success contributed very materially to both psychological and physical recovery.

So far we have considered only defects at the lowest level of the purely terminal effector apparatus, but it does seem that something can be done for those whose damage lies on a higher, or more intellectual, plane. In these cases the lesion is usually in the region just anterior to the purely "motor" cortex of the dominant hemisphere[1] and it is manifest by inability to reproduce some particular muscular pattern. The condition may depend upon a congenital deficiency or upon a slowness in maturation. The child is "backward", and in either case it is relatively helpless until time effects a cure or betrays permanent defect. Even in gross congenital defect patience and skill may make something of what remains; while in children who are only relatively "backward" training may hasten the learning process, possibly by stimulating a dormant cortical mechanism. We must not forget, however, that there are two hemispheres and that "backwardness" may be due to conflict over dominance as the result of injudicious handling at an earlier age. As has already been noted, the relative speech apraxia of stuttering may be produced by an attempt to convert a right into a left cerebral dominance. Any success gained in treating such patients may be due to one of a number of causes. The conflict may be resolved by reversion to the original dominance; or training may establish and confirm the new dominance; or a compromise may be reached by bringing both hemispheres into equal partnership so that both sides of the body have equal facility—ambidexterity is not uncommon in originally left-handed people. Finally, you cannot ignore the quality of the material you have to deal with; poor material permits of only limited success, but good material is capable of almost anything.

Apraxias in adults are much more dramatic, because they are usually made manifest by the abrupt loss of a previously facile everyday activity. While sometimes of psychological origin, such defects are generally attributable to damage or disease, such as cerebral hæmorrhage. This is often the harbinger of the end, or at least leaves the victim too ill to suffer any immediate efforts towards reparation. In young people, however, and even in the more elderly who survive the insult, good results may sometimes ensue. In a number of cases aphasia from damage to Broca's area in the left hemisphere has gradually cleared up to a workable extent, and the recovery has been attributed—probably justly—to some assumption of control by the previously dormant right Broca's area. In this respect the younger have an advantage over the more rigidly determined elderly, and of course the originally left-handed are in a very favourable position compared with those who were always right-handed. Sometimes damage to one or other of Broca's areas does not produce the speech defect that would be anticipated from the "handedness" of the victim. Then we must assume either that both hemispheres are equally potent or that the indications from "handedness" are misleading—this character having been acquired after cerebral dominance had been determined to the extent of "fixing" the control of speech. It seems likely that similar explanations must be sought in many puzzling cases of recovery from other apraxias; at all events, such considerations justify attempts at retraining and encourage a limited optimism as to the outcome.

It is well known that in many acute nervous conditions the initial functional defect is the worst, from which there is more or less recovery to a level determined by the magnitude of the permanent nervous damage. In such cases, however, it may be difficult to decide whether the residual defect is due to permanent damage or to the imperfect assumption of control by an alternative mechanism. The question of actual nervous regeneration naturally arises here; but although such regeneration has been claimed for some animals under experimental conditions, clinical experience does not support the view that this possibility is of much practical importance in damage or disease of the human brain. This leaves the prospect of a reserve of nervous tissue not normally exploited and opens up fascinating avenues of speculation into which I cannot enter now. So I must be content to point out that some other organs—for example, the liver and kidney—do possess quite a large reserve which is available in emergency. According to Herrick the human cerebral cortex contains something like 1,000,000,000 nerve cells whose possible permutations and combinations amount to a figure that would impress even an astronomer. Surely, of this multitude, not all are in active employment; indeed, we have already noted the probability that a great deal of the non-dominant hemisphere is relatively unused. Perhaps it is unkind to say that the bulk of humanity gives little evidence of expanding even a fraction of its cerebral capital; but it is not unreasonable to believe that nobody has yet succeeded in exploiting all the potentialities of this vast mechanism. A great deal remains

[1] I exclude here what may be called "pseudo-apraxias" produced by comparable defects on the afferent, or sensory, side of the total nerve circuit.

to be done, then, both by you in your sphere of interest and by mankind in general. Dare we hope that one day the world at large will learn to experiment with its cerebral possibilities and, perhaps, replace some of its time dishonoured and obsolete activities with other (and maybe better) ways of doing some of the things it does not seem to be doing very well just at present?

THE DIAGNOSIS OF FALLOT'S TETRALOGY AND THE RATIONALE OF ITS SURGICAL TREATMENT.

By MALCOLM N. ALLEN,
Thoracic Surgical Unit, Alfred Hospital, Melbourne.

THE exact anatomical diagnosis of congenital heart lesions is of increasing significance in medical practice since three of the most common of these lesions are now amenable to surgery, the successful practice of which results in considerable alleviation of symptoms in one instance and cure in the other two. The lesions referred to are patent *ductus arteriosus* (Gross,[1] 1938), coarctation of the aorta (Crafoord,[2] 1945; Gross,[3] 1945) and congenital lesions associated with pulmonary stenosis or atresia (Blalock,[4] 1945).

The last-mentioned lesion, generally referred to as the tetralogy of Fallot, was described by William Hunter long before Fallot's description. Fallot, however, was the first clinician to realize that the lesion could be recognized clinically. The anatomical defect which bears his name consists of dextroposition of the aorta, interventricular septal defect, and right ventricular hypertrophy with pulmonary stenosis, the result of hypoplasia of the pulmonary artery. A diagrammatic view of the defect is shown in Figure I. There is right ventricular enlargement due to pulmonary stenosis, the dextroposed aorta overrides the septal defect and consequently a mixture of venous and arterial blood enters the aorta. Only a small volume of blood flows through the lungs and this volume is returned to the left auricle.

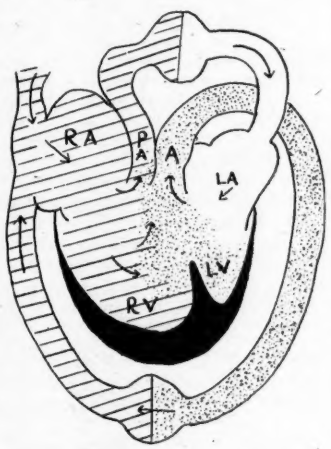


FIGURE I.
Circulation in tetralogy of Fallot showing (i) large patent interventricular septum, (ii) pulmonary stenosis, (iii) dextroposition of aorta, and (iv) right ventricular enlargement.

Diagnosis.

It is difficult to make an accurate diagnosis in an infant under the age of twelve months; cyanosis may not be apparent or noticed particularly, and the X-ray findings are difficult to interpret. As the child grows older the diagnosis becomes relatively easier.

The clinical features in a classical lesion are as follows. Cyanosis, clubbing of fingers and secondary polycythæmia are present; the mental and physical condition is not necessarily below par, although dyspnœa on mild exertion is a feature; auscultation of the heart reveals a systolic murmur over the base of the heart with maximal intensity over the pulmonary area. It can often be detected posteriorly between the shoulder blades. X-ray examination shows a boot-shaped silhouette of the heart, the *"cœur en sabot"*. The electrocardiogram classically shows a marked right axis deviation.

The Appearance of the Patient.

Cyanosis may not be pronounced particularly during early life. With increasing activity it becomes more noticeable, and the mothers of such children frequently state that their child went blue only when he cried, but as he grew older the blueness became more apparent and persistent. Accompanying the cyanosis in older children is a considerable degree of polycythæmia and clubbing of the fingers. In one patient operated upon the red blood cell count reached ten and a half million per cubic millimetre, the hæmoglobin value 27 grammes per 100 millilitres of blood (188% Sahli).

Dyspnœa on mild exertion is nearly always present. It has been pointed out that cyanosis and dyspnœa may not be at all marked with minimal malformations if the oxygen saturation of the arterial blood remains above 66%.[5] In such cases there is no compensating polycythæmia, and such patients seldom come under surgical consideration. Taussig has commented on the physical appearance of patients with Fallot's tetralogy—the cyanosis, polycythæmia, clubbed fingers and dyspnœa on mild exertion—and in addition has observed a characteristic squatting posture assumed by such patients after exercise.[6] She states that it has diagnostic value.

Clinical Examination of the Heart.

The clinical examination of the heart reveals no pathognomonic findings. A systolic murmur is usually present situated over the base of the heart with maximal intensity over the pulmonary area and extending sometimes down the left border of the sternum and between the shoulder blades posteriorly. The pulmonary second sound may be normal, weak or absent. The murmur may be due to the septal defect or to the pulmonary stenosis.

The Electrocardiogram.

The electrocardiogram is not diagnostic, but characteristically shows marked right axis deviation, high *P* waves and notched *QRS* complexes. The absence of right axis deviation should make the diagnosis suspect.

X-ray Examination.

X-ray examination of the heart and lung fields shows a normal sized heart or occasionally an enlarged heart.

Cardiac Enlargement.—Enlargement is due to hypertrophy of the right ventricle resulting in enlargement to the left of the heart shadow, so that the apex is lifted away from the diaphragm and has a blunted appearance. This silhouette (Figure II) resembles a wooden boot and is referred to as *"cœur en sabot"*.

The Pulmonary Conus.—Because of atresia of the pulmonary artery there is absence of the normal conus and a concavity can often be seen in this region (Figure II). This appearance is contrasted with patent *ductus arteriosus* in which there is prominence of the pulmonary conus due to dilatation of the pulmonary artery. The concavity shows up best in films of the chest from the right anterior oblique position. The hilum vessels are small and no hilar dance can be detected on fluoroscopy. Films from the left anterior oblique position characteristically show an abnormally clear pulmonary window, and Blalock attaches considerable value to this finding.[4]

The Pulmonary Fields.—The pulmonary fields should be free from congestion. Congestion of the lung fields suggests the possibility of an Eisenmenger's complex or transposition of the aorta and pulmonary artery.

Right Aortic Arch.—Right aortic arch accompanies the tetralogy of Fallot in over 20% of cases[4] and should be carefully noted as the surgical approach is different if Blalock's operation is contemplated. This can be demon-

strated by careful fluoroscopic examination and the swallowing of a barium bolus as described by Bedford and Parkinson.[6]

Differential Diagnosis.

The majority of children surviving infancy who have congenital heart disease with persistent cyanosis and polycythæmia are suffering from the tetralogy of Fallot. However, a number of rare anomalies may give rise to a similar clinical picture and the four most common of these are of interest.

The Eisenmenger Complex.

The Eisenmenger complex is an uncommon variation of Fallot's tetralogy; dextroposition of the aorta, interventricular septal defect and right ventricular hypertrophy are present as before, but there is no pulmonary stenosis.

The cyanosis is rarely as great as in the tetralogy of Fallot and may not appear for years. Dyspnœa on exertion is not nearly so pronounced. The chief diagnostic aid is X-ray examination of the heart and lung fields. An enlarged pulmonary conus shadow, enlarged hilar shadows and congested lung fields point to the correct diagnosis.

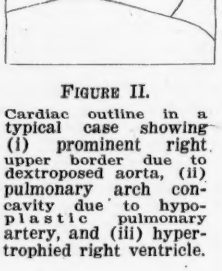


FIGURE II.

Cardiac outline in a typical case showing (i) prominent right upper border due to dextroposed aorta, (ii) pulmonary arch concavity due to hypoplastic pulmonary artery, and (iii) hypertrophied right ventricle.

Transposition of the Great Vessels.

Children with transposition of the great vessels do not often survive the period of infancy. Cyanosis is often marked early. Again the X-ray appearances are diagnostic; the heart shadow is greatly enlarged downwards and to the left, the mediastinal shadow is narrow and, consequently, the cardiac silhouette is of a peculiar globular shape. The aorta lies anterior to the pulmonary artery and this can be detected on fluoroscopic examination.

Gross Septal Defect.

Cyanosis and clubbing are a feature where there is complete absence of the septal wall. The prognosis is poor, the patients rarely surviving beyond infancy. A soft systolic murmur over the base of the heart may be present, but is often absent. The electrocardiogram shows large *QRS* complexes in all leads, while X-ray examination shows a considerably enlarged spherical mitral type of heart silhouette.

Pulmonary Arterio-Venous Shunt.

The syndrome of cyanosis, polycythæmia and clubbing of the fingers found in the absence of cardiac or pulmonary disease in adults is diagnostic of pulmonary arteriovenous fistula.[7]

The Rationale Behind the Surgical Treatment of the Tetralogy of Fallot.

The four factors underlying the production of clinical cyanosis have been listed by Lundsgaard and Van Slyke[8] as (i) diminished oxygenation within the lungs, (ii) direct venous-arterial shunt in the heart or systemic circulation, (iii) increased utilization of oxygen in the peripheral circulation due to stasis, and (iv) high hæmoglobin content of the blood.

All of these factors play a part in the production of cyanosis in patients suffering from the tetralogy of Fallot. Attention has been focused on the first of these factors, that is, diminished oxygenation within the lungs. This factor depends on the ventilation of the lungs, the rate of blood flow through the lungs, the partial pressure of oxygen in the alveoli and the condition of the alveolar membrane through which the exchange of oxygen occurs.

Under normal conditions no alteration can be effected in the factors controlling the diminished oxygenation within the lungs. During exercise the oxygen consumption of patients with the tetralogy of Fallot falls, owing in all probability to the fact that the pulmonary stenosis limits the increase in pulmonary blood flow normally accompanying exercise. The alveolar oxygen partial pressure is not raised under normal conditions, although under anæsthesia, largely as a result of increase in the partial pressure of oxygen, the cyanosis lessens. The polycythæmia is an example of an attempt to provide an increased oxygen capacity in the circulating blood. The condition of the alveolar membrane is not a negligible factor, as permanent alveolar changes tend to occur after a certain age in patients suffering from the tetralogy of Fallot, and these changes effectively prevent adequate oxygenation even in the presence of optimum alterations in the other factors.

Taussig and Blalock in 1945 published an account of brilliant investigation into a procedure designed to overcome some of these factors. In particular they demonstrated the importance of an inadequate pulmonary circulation as one of the factors producing cyanosis in patients with the tetralogy of Fallot. The operation devised by Blalock increased the proportion of the total circulating volume passing through the pulmonary circuit by means of an anastomosis between the pulmonary artery and a systemic vessel. The increased circulation to the lungs so gained brings about an increase in oxygen saturation of the arterial blood, reduces the cyanosis and lowers the degree of polycythæmia. In Blalock's original work anastomosis was effected between the subclavian or innominate and the pulmonary arteries. Potts later devised the operation performed at the Alfred Hospital, namely, anastomosis of the aorta to the pulmonary artery. In either instance the effect is the same. The immediate clinical benefit to the patient is a great reduction in cyanosis, and, because of the increased arterial oxygen saturation, a much better exercise tolerance is achieved.

Summary.

1. The diagnostic features of the congenital heart lesion referred to as Fallot's tetralogy are discussed.

2. The growing need for exact anatomical diagnosis of congenital heart lesions is stressed.

3. A brief account of the rationale behind the surgical treatment for the lesion is presented.

References.

(1) R. E. Gross and J. P. Hubbard: "Surgical Ligation of Patent Ductus Arteriosus: Report of First Successful Case", *The Journal of the American Medical Association*, Volume CXII, 1939, page 729.

(2) C. Crafoord and G. Nylin: "Congenital Coarctation of the Aorta and its Surgical Treatment", *The Journal of Thoracic Surgery*, Volume XIV, 1945, page 347.

(3) R. E. Gross and C. A. Hufnagel: "Coarctation of the Aorta: Experimental Studies Regarding its Surgical Correction", *The New England Journal of Medicine*, Volume CCXXXIII, 1945, page 287.

(4) A. Blalock and H. B. Taussig: "The Surgical Treatment of Malformations of the Heart in which there is Pulmonary Stenosis or Pulmonary Atresia", *The Journal of the American Medical Association*, Volume CXXVIII, 1945, page 189.

(5) A. Blalock and H. B. Taussig: "Observations on the Volume of the Pulmonary Circulation and its Importance in the Production of Cyanosis and Polycythemia", *American Heart Journal*, Volume XXXIII, 1947, page 413.

(6) D. E. Bedford and J. Parkinson: "Right Sided Aortic Arch", *The British Journal of Radiology*, Volume IX, 1936, page 776.

(7) H. B. Burchell and O. T. Clagett: "The Clinical Syndrome Associated with Pulmonary Arteriovenous Fistulas Including a Case Report of a Surgical Cure", *American Heart Journal*, Volume XXXIV, 1947, page 151.

(8) C. Lundsgaard and D. D. Van Slyke: "Cyanosis", *Medicine*, Volume II, 1923, page 1.

(9) W. J. Potts, S. Smith and S. Gibson: "Anastomosis of the Aorta to a Pulmonary Artery", *The Journal of the American Medical Association*, Volume CXXXII, 1946, page 627.

SURGICAL TREATMENT OF FALLOT'S TETRALOGY.

By C. J. OFFICER BROWN,
Thoracic Surgical Unit, Alfred Hospital, Melbourne.

FOR brilliance of conception, perfection of technique and courage of execution Blalock's work on the surgical treatment of pulmonary stenosis must rank as one of the most outstanding surgical achievements of all time.

It has been a triumph of teamwork by a physician, Dr. Helen Taussig,[1] a surgeon, Dr. Blalock,[1] and physiologists and anæsthetists at the Johns Hopkins Medical School, and would not have been possible without resort to animal experimentation. Taussig formed the opinion that the major defect in many patients with congenital heart disease was an inadequate flow of blood to the lungs, and Blalock set out to devise an operation to divert a proportion of the blood from the systemic circulation into the pulmonary artery.

On November 29, 1944, he performed the first operation of this type on a child aged sixteen months, suffering from Fallot's tetralogy. He choose to anastomose the proximal end of the divided left subclavian artery into the side of the left pulmonary artery. The operation was dramatically successful. On his second attempt, although he knew that the aorta was on the right side, as it is in over 20% of patients with Fallot's tetralogy, he failed to appreciate that the innominate artery would be on the left side and at operation he was forced to use this vessel instead of the left subclavian artery. He decided that the innominate artery was a better vessel to use than the left subclavian, but later experience showed that, although the division of a subclavian artery never caused any serious interference with the circulation of the arm, division of the innominate or of a carotid artery frequently resulted in serious cerebral damage.

In February, 1947, Blalock[2] reported his experience with 243 patients who had been operated on by himself and his associates. At that time, in approximately 147 cases in which the end of a subclavian artery had been joined to the side of a pulmonary artery, the mortality was 9%, and of approximately 57 patients in whom the carotid or innominate artery had been used, 33% died. The overall mortality among all patients operated on, including those in whom the diagnosis was wrong and those in whom the operation could not be completed, was 21% and for the second hundred patients it was 15%. Before June, 1947, no less than 450 patients had been operated upon.[3]

Sometimes when the right pulmonary artery has been too short, or too small, for end-to-side anastomosis, Blalock has divided it and joined the distal end to the end of the chosen systemic vessel. It is his opinion that the most satisfactory operation is end-to-side anastomosis of the divided subclavian branch of the innominate artery to the right pulmonary artery or, in patients with a right-sided aorta, to the left pulmonary artery.

In young infants the subclavian artery may be too small for anastomosis, and in patients who have attained most of their growth the gap to be bridged is greater in relation to the length of the subclavian artery and the structures are less pliable and elastic. For these reasons, Blalock prefers to operate between the ages of three and ten years and would not advise operation in children less than eighteen months old unless it seemed unlikely that the child would survive to this age without operation. Diagnosis is more difficult in infants, and the mortality rate is higher, and it is more often necessary to use the carotid or the innominate artery and this further increases the hazard.

After a successful operation cyanosis disappears, and in many cases the child appears completely normal. Polycythæmia is steadily reduced as the need for it has been removed. Arterial oxygen saturation rises from a resting level of less than 50% to between 65% and 88%. As there are always a high interventricular septal defect and an overriding aorta, it cannot be expected that oxygen saturation of the arterial blood will rise to the normal figure of 95% to 98%, and too big an artificial ductus would place an undue strain on the heart. Taussig[4] suggests that an arterial oxygen saturation of 65% to 70% may be sufficient to enable the child to undertake considerable activity and does not necessarily lead to the development of polycythæmia. Although the resting arterial oxygen saturation in these patients may be 70% to 80% or even higher, with exercise it falls considerably and may reach a level of 30% or less. After operation, exercise no longer causes a marked fall of resting arterial oxygen saturation.

In November, 1946, Willis J. Potts, Sydney Smith and Stanley Gibson[5] described a technique for making a direct anastomosis between the aorta and the left pulmonary artery, using a special clamp they had devised to exclude a segment of the circumference of the aorta to which the anastomosis was to be made without completely interrupting the flow of blood in this vessel. They reported the histories of three patients in whom this operation had been performed with one death. In March, 1947, Potts informed me in a personal communication that they had performed sixteen operations with three deaths, and with excellent results in all the survivors except one; and I have been informed that in May, 1947, at the annual meeting of the Association of Thoracic Surgeons, he reported a series of thirty patients operated on with a mortality rate of 13·4%. At the beginning of 1947 we set out to acquire the technique of Blalock's operation on dogs and had several failures, partly because our clamps were not satisfactory and partly because we were trying to carry out the operation on the right side; in the dog the right pulmonary artery branches very early, and on this account the anastomosis is difficult. At this stage my anæsthetist, Dr. R. H. Orton, made a Willis Potts clamp, and with this we performed a series of about a dozen aortic-pulmonic anastomoses on dogs without mishap. Asepsis was a little primitive in the laboratory, and it was our practice to leave 100,000 units of penicillin in the pleural cavity before closing the chest. Two dogs in which we did not do this died a few days after operation with empyema. All the others survived with apparently very little inconvenience. They developed a continuous murmur resembling that of a patent *ductus arteriosus* with some enlargement of the heart and considerable dilatation of the pulmonary artery as one would expect with the creation of an artificial *ductus arteriosus*. At autopsy, in every dog the anastomosis was patent and satisfactory. Realizing that the left pulmonary artery in the dog is a very much more satisfactory vessel to work with than the right one, we have since successfully carried out the Blalock operation on this side and we have also performed it successfully on the right side, but this is much more difficult.

Both Blalock's and Willis Potts's operations have advantages, and it is too soon to say which will prove more satisfactory in the long run. The use of the subclavian artery seems to be without ill effect on the patient, and, where this vessel is anatomically suitable and of sufficient size, it is likely that this will prove the better operation. Use of the innominate or carotid artery results in a higher mortality and should be avoided if possible. With experience, the size of an aortic-pulmonic anastomosis might be varied to suit the needs of a particular case, and, in young infants whose vessels are small, I think the aortic-pulmonic anastomosis would probably prove the easier operation. It is not yet known whether the artificial *ductus arteriosus* created by either method will enlarge with the growth of the child. If it does not, symptoms may return, as it becomes relatively smaller in relation to the enlarging arteries. On the other hand, the opening may dilate even to the stage of decompensation as occurs in some patients with a natural patent *ductus arteriosus*. Time alone will provide the answers to these questions, but, because of the many variations that will be found in the vessels in these cases, the surgeon who atempts the operation should be prepared to alter his technique when he sees the condition inside the chest. Blalock's operation should be performed on the side opposite to the aorta, so that the subclavian branch of the innominate artery may be used for the anastomosis.

If it is unsuitable, choice remains between the innominate artery and the carotid branch of the innominate. Blalock states that it is easier when the aorta is on the right side, as it is in over 20% of patients with Fallot's tetralogy, because the pulmonary artery on the left side is usually longer than that on the right side. Obviously Willis Potts's operation must be performed on the side on which the aorta is placed, and it too is easier on the left side. Perhaps it would be reasonable to operate always on the left side and to carry out Willis Potts's operation if the aorta is on that side, or Blalock's operation if the aorta is on the other side.

Indications for Operation.

The creation of an artificial *ductus arteriosus* is designed to increase the circulation to the lungs and thus to improve the patient's capacity for exercise. Some patients with little apparent cyanosis may be unable to tolerate any activity without distress, and in these cases Blalock[3] suggests that arterial oxygen saturation should be estimated with the patient at rest and after exercise, and it will often be found that, although when they are at rest their oxygen saturation is reasonably good, after exercise it falls to a level quite incompatible with activity. Taussig[6] states that the factors influencing the selection of patients for operation are (i) the age and size of the patient, (ii) the severity of the anoxia, (iii) the height of the red blood cell count, the hæmoglobin value and the hæmatocrit reading. She considers that operation should not be attempted before the age of three years unless the disability is severe and is likely to be fatal before this age. Operation should be advised for children between the ages of three and ten years with marked exercise intolerance and correspondingly low arterial oxygen saturation. With a polycythæmia in which there are between eight and ten million red cells per cubic millimetre or a hæmatocrit reading between 76% and 80%, the patient is in great danger of cerebral thrombosis and operation should not be delayed. Dehydration, by increasing the viscosity of the blood, increases the risk of thrombosis, and it is important that it should be avoided before operation and at operation. In his early operations Blalock frequently performed a venesection at the end of the operation and gave saline solution or plasma instead of blood during its course. Now he has given up venesection unless polycythæmia is extreme, and, although he starts with a plasma infusion, he changes to blood if there is any considerable blood loss at operation.

Case Reports.

CASE I.—K.P., a male, aged eighteen months, was admitted to the Alfred Hospital on September 18, 1947; his mother stated that he had suffered from "blue turns" since birth. Bottle feeding was commenced at the age of one and a half months because he was blue all the time and turned black when feeding from the breast, and usually vomited. He took the bottle well and had taken his food satisfactorily ever since. He had remained in hospital until he was ten months old and since discharge had been cyanosed all the time with attacks of deep cyanosis sometimes two or three times a day and sometimes occurring once every two or three days.

On examination he was a well-nourished baby with very blue lips and hands. His temperature on admission was 104·4° F., his pulse rate 154 per minute, and his respiration rate 26 per minute, and the systolic blood pressure was 125 millimetres of mercury and the diastolic 65 millimetres. The heart was not enlarged and there was a systolic bruit audible all over the heart with a clear second sound. The hands and feet were very blue with early clubbing of fingers and toes. Clinical examination revealed no other abnormality. Penicillin was administered and the pyrexia subsided in forty-eight hours, but the child continued to run a temperature from 99° to 100° F. each evening. X-ray examination of the chest showed an absence of congestion in the lung fields, with the characteristic boot-shaped heart and an absence of the shadow of the pulmonary artery. The aorta was on the left side. An electrocardiogram showed right axis deviation. The red blood cell count was 8,300,000 per cubic millimetre, and the hæmoglobin value was 15 grammes per 100 millilitres (102% Sahli).

Operation was performed on October 7, 1947. The anæsthetic was administered by Dr. R. H. Orton and is described in detail in his accompanying paper. The patient was placed in the lateral position and the pleural cavity entered by excising the left fifth rib. The lung was packed out of the way, and the aorta and the left pulmonary artery were exposed; they were seen to be covered with a number of anastomotic vessels containing dark blood. These vessels were carefully dissected away and ligated in order to isolate, first, the left pulmonary artery, and, second, the aorta at the level where it was crossed by the pulmonary artery. The pleura over the aorta was incised and the aorta raised from its bed and freed by ligation and division of the fourth and fifth intercostal arteries and a few other small branches. When the aorta had been freed, the smallest aortic clamp was passed round it; the aorta was too small for the clamp and, after the clamp had been applied, slipped back and the clamp had to be reapplied. An incision about six millimetres long was made in the isolated segment of the aorta and then the pulmonary artery was surrounded by heavy silk ligatures and fixed to the loops of the clamp. An incision was made in the pulmonary artery, corresponding to the one in the aorta, and the two openings were sutured together after the manner of Willis Potts. When the posterior row of sutures had been partially placed, the aorta slipped back in the clamp and it was necessary to control the flow of blood in the aorta with two tapes at either end of the clamp while the clamp was reapplied. After the clamp had been reapplied it was realized that it was completely occluding the aorta; no thrill and no pulsation could be felt below the clamp. The anastomosis was continued without further difficulty. The clamp was in position on the aorta with apparently complete occlusion of this vessel for exactly thirty minutes. After completion of the anastomosis the temporary ligatures were taken off the pulmonary artery, first from the distal end and then from the proximal end. There was some slight oozing from the suture line. Despite this the aortic clamp was removed and oozing then became quite brisk, but it was controlled by applying a gauze pack to the region for a minute or two. When this was removed there was practically no further oozing. A small piece of "Oxycel" soluble gauze was placed in the gap behind the aorta and another very minute piece over the anterior suture line as an additional precaution. A thrill could be felt in the region of the anastomosis. The lung was reexpanded and the chest was closed in layers, 50,000 units of penicillin in five millilitres of saline solution being left in the pleural cavity. The patient's condition at the end of operation was very good and he appeared to be slightly less cyanotic than before operation. No noticeable change could be heard in the murmur in the second and third left intercostal spaces. The total operating time was three hours and approximately 200 millilitres of blood were administered during operation.

The next day the baby's condition was very satisfactory. The rectal temperature was 104° F., the pulse rate 150 per minute, and the respiration rate 28 per minute. He cried lustily when disturbed. Cyanosis had almost completely disappeared and was only very slightly noticeable on vigorous crying. No murmur could be heard on auscultation. He was kept in an open tap oxygen tent for the first four or five days after operation and then oxygen administration was discontinued. On the day after operation the red blood cell count was 7,400,000 per cubic millimetre and the hæmoglobin value 86% (Sahli). X-ray examination of his chest showed that the left lung was well expanded, but there was some fluid at the base. On the fourteenth day he was not so well, appeared to be unhappy and was slightly dyspnœic; X-ray examination showed a moderate collection of fluid at the base of the left lung. The chest was aspirated and eight ounces of thin, white pus were obtained. Many pus cells were seen in a smear, but no organisms. Fifty thousand units of penicillin were introduced into the pleural cavity. On incubation a very few colonies were grown of a *Streptococcus viridans* which was only slightly sensitive to penicillin, but was more sensitive to sulphadiazine; he was therefore given half a gramme of sulphadiazine four-hourly, in addition to the penicillin which he was receiving parenterally. Aspiration was repeated on alternate days and the same sort of thin pus obtained. On the twentieth day the red blood cell count was 6,950,000 per cubic millimetre, and the hæmoglobin value was 13 grammes per 100 millilitres (88% Sahli). Cyanosis was almost completely absent, even on crying, and a definite systolic and diastolic murmur was audible in the second left intercostal space. On the twenty-eighth day he sat up for the first time in his life.

After this his progress was uneventful; no more fluid accumulated in the chest, his slight fever settled down and he took his food very well. On the thirty-third day his red blood cell count was 7,100,000 per cubic millimetre, and

the hæmoglobin value was 12 grammes per 100 millilitres (85% Sahli). He was discharged from hospital in good condition on the fifty-fourth day.

CASE II.—A.P., a female, aged seven years and four months, was a normal seven and a half pounds baby; cyanosis was first noticed at the age of three months and had steadily increased. For the last year or two she had been very deeply cyanosed all the time and had spent most of the winter in bed with bronchitis. During the last six months she had been very excitable and any excitement or any exertion resulted in increased depth of cyanosis and complete collapse, although she did not actually lose consciousness. These attacks had been growing more frequent and had been occurring every day and sometimes several times a day. On examination she was a thin child, deeply cyanosed; her fingers and toes were very grossly clubbed and were a violet-blue colour. Her heart was not enlarged, and there was a loud systolic murmur in the pulmonary area with a well-marked second sound and no definite thrill. She was very irritable and difficult to examine. X-ray examination showed enlargement of the right ventricle with a small pulmonary artery. The aorta was on the left side. There was a well-defined azygos lobe on the right side and the lung fields were not congested. An electrocardiogram showed right axis deviation. Blood examination showed 10,270,000 red cells per cubic millimetre; the hæmoglobin value was 27 grammes per 100 millilitres of blood (188% Sahli) and the hæmatocrit reading was 85%. On November 10, 1947, a Willis Potts aortic-pulmonic anastomosis was performed. The anæsthetic was again administered by Dr. R. H. Orton. Isolation of the vessels was complicated by the presence of a very definite network of anastomotic channels surrounding the root of the lungs and the aorta. These had to be tediously isolated and ligated before the pulmonary artery and the aorta could be freed. An anastomotic opening about eight millimetres long was made using 00 "Mersilk" on ten millimetre curved needles. When the clamps were removed, free oozing occurred from a point in the anterior suture line, but it was readily controlled by pressure with gauze, and finally a small piece of "Oxycel" soluble gauze was placed in the space behind the anastomosis and another piece over the suture line anteriorly. The lung was reexpanded and the chest wall closed in layers. No penicillin was left in the pleural cavity, because it was felt that, as Fleming[7] has shown, it might lower the coagulability of the blood and increase oozing. About 250 millilitres of whole blood were administered during the course of the operation. The patient was returned from the theatre and placed in an oxygen tent. Her condition remained good. The next day her red blood cell count was 9,500,000 per cubic millimetre, the hæmoglobin value was 21 grammes per 100 millilitres (142% Sahli) and cyanosis had almost disappeared. On the sixth day X-ray examination of her chest showed some effusion at the base of the left lung, and ten ounces of blood-stained fluid were aspirated. After operation the pulse rate varied from 100 to 120 per minute; the temperature never rose above 99·6° F. Fifty thousand units of penicillin were given parenterally eight-hourly for the first ten days and then its administration was stopped, as she had remained afebrile for three days. *Tinctura Digitalis* five minims was given three times daily from the twelfth to the twentieth day, but did not affect the pulse rate. On the seventeenth day her erythrocyte count was 6,300,000 per cubic millimetre; the hæmoglobin value was 18·5 grammes per 100 millilitres (128% Sahli). She was discharged from hospital in good condition on the twenty-third day after operation.

Comment.

Estimations of arterial oxygen saturation were not made for either of these children. Both of them were very irritable and easily upset, and in both cases the operation was obviously indicated because of the degree of polycythæmia and the cyanosis and the disability resulting from anoxia; it was felt that it was not desirable to submit either of them to the disturbance that would have resulted from arterial puncture. Clinically the relief of cyanosis and polycythæmia and increased tolerance to exercise are very striking in both cases, and it is obvious that arterial oxygen saturation has been raised from a low level to a much more normal figure which we hope later on to estimate by arterial puncture. In both cases the heart is now a little larger than before operation, and it must always be realized that relief of anoxia in these cases can only be obtained at the price of an added burden on the myocardium; but it cannot be doubted that their post-operative state is infinitely preferable to the anoxia from which they had been suffering.

It is interesting to find in the first case that complete occlusion of the aorta for thirty minutes had no ill effect on the child. It is well recognized that in cases of coarctation of the aorta the aorta may be closed with clamps for the time necessary for excision of the narrowed area and the subsequent anastomosis, and in one case of coarctation Alexander[8] excised an aneurysm with permanent ligation of the aorta, and the patient survived for over two years. Crafoord[9] places clamps on the aorta while he divides and sutures the patent *ductus arteriosus* and has seen no ill effects.

References.

(1) Alfred Blalock and Helen B. Taussig: "The Surgical Treatment of Malformations of the Heart", *The Journal of the American Medical Association*, Volume CXXVIII, 1945, page 189.

(2) Alfred Blalock: "The Use of Shunt or By-Pass Operation in the Treatment of Circulatory Disorders Including Portal Hypertension and Pulmonic Stenosis", *Annals of Surgery*, Volume CXXV, 1947, page 129.

(3) Alfred Blalock: "The Technique of Creation of an Artificial Ductus Arteriosus in the Treatment of Pulmonary Stenosis", *The Journal of Thoracic Surgery*, Volume XVI, 1947, page 244.

(4) Helen B. Taussig and Alfred Blalock: "Observations on the Volume of the Pulmonary Circulation and its Importance in the Production of Cyanosis and Polycythæmia", *American Heart Journal*, Volume XXXIII, 1947, page 413.

(5) Willis J. Potts, Sidney Smith and Stanley Gibson: "Anastomosis of the Aorta to a Pulmonary Artery", *The Journal of the American Medical Association*, Volume CXXXII, 1946, page 627.

(6) Helen B. Taussig: "Diagnosis of Tetralogy of Fallot and Indications for Operation", *The Journal of Thoracic Surgery*, Volume XVI, 1947, page 241.

(7) Sir Alexander Fleming and E. W. Fish: "Influence of Penicillin on the Coagulation of Blood", *British Medical Journal*, Volume II, 1947, page 242.

(8) John Alexander and Francis X. Byron: "Aortectomy for Thoracic Aneurysm", *The Journal of the American Medical Association*, Volume CXXVI, 1944, page 1139.

(9) Clarence Crafoord and G. Nylin: "Congenital Coarctation of the Aorta and its Surgical Treatment", *The Journal of Thoracic Surgery*, Volume XIV, 1945, page 347.

Addendum.

Since this paper was submitted for publication, nine more patients have been operated on. In two the left pulmonary artery was inadequate and the operation could not be completed. One of these patients died. All the others recovered and are clinically improved.

An aortic pulmonary anastomonis was done in seven patients and a subclavian pulmonary anastomosis was done in two patients. All the operations were done on the left side.

ANÆSTHESIA IN THE SURGICAL TREATMENT OF THE TETRALOGY OF FALLOT.

By R. H. ORTON,

Anæsthetist to the Thoracic Surgical Unit, Alfred Hospital, Melbourne.

THE problems of anæsthesia and of post-operative management in the surgical treatment of congenital pulmonary stenosis have been discussed by Harmel and Lamont,[1] in view of their experiences with the first 100 patients treated surgically by Blalock at Baltimore. Little else has appeared in the literature since their paper was published in September, 1946, so that it was considered to be justifiable to describe two cases at the Alfred Hospital in which the technique of anæsthesia differed somewhat from that described by them.

Blalock and Taussig[2] have detailed the abnormalities, both anatomical and physiological, that are present in

patients suffering from the tetralogy of Fallot. Some of the latter are of extreme importance to the anæsthetist and will be repeated here, but in a form which follows more closely the statements of Lundsgaard and Van Slyke.[a] Blalock and Taussig, in their papers, claim to be quoting from the writings of these outstanding workers in the field of cyanosis; but reference to the original publications will show that in several instances their quotations are inaccurate.

Cyanosis and Anoxia.

It is unusual for an anæsthetist to be confronted with a deeply cyanosed patient; but in the condition under discussion cyanosis is the outstanding clinical feature, and the reasons for its presence, together with its relationship to anoxia, must be considered in order that the physiological problems that the anæsthetist must solve may be understood.

The degree of cyanotic colour in a patient is determined by the mean reduced hæmoglobin content of the capillary blood (C). Clinical cyanosis appears when the capillary blood contains at least five grammes of reduced hæmoglobin per 100 millilitres and the capillary oxygen unsaturation reaches 6·7 volumes *per centum*. According to Lundsgaard and Van Slyke, the following four conditions determine the depth of cyanosis in patients suffering from congenital pulmonary stenosis: (i) the total hæmoglobin content of the blood (T); (ii) the fraction of the total blood shunted through the patent interventricular septum from the right to the left side of the heart (a); (iii) the content of hæmoglobin deoxygenated in the passage of blood from the arteries to the veins (D) (this figure depends in part upon the rate of utilization of oxygen by the body tissues); (iv) the fraction of the total hæmoglobin content, passing in reduced form through aerated portions of the lungs (l); this fraction indicates the extent of aeration of the blood passing through the lungs, and the smaller the fraction, the more complete will be the aeration of the blood. This last condition, (iv), depends upon (a) the pulmonary ventilation, (b) the rate of blood flow through the lungs, (c) the partial pressure of oxygen in the inhaled gases, and (d) the permeability of the pulmonary alveolar membranes to oxygen (incorrectly designated the α factor by Blalock and Taussig). To the above Blalock and Taussig would add (e) the volume of blood passing through the lungs for aeration. If the equation of Lundsgaard and Van Slyke $\left(C = lT + \frac{(1+a)D}{2(1-a)}\right)$ is considered, it is obvious that it is not necessary to introduce this addition. The volume of blood passing through the lungs depends entirely upon the fraction of the total blood shunted through the patent interventricular septum, and in the equation the pulmonary fraction is $(1-a)$. Blalock and Taussig state that "the demonstration of the α factor completely overshadowed another vitally important factor, namely, the volume of blood which reaches the lungs for aeration". In fact, one factor is entirely dependent upon the other, and the outcome of their operation is to introduce a negative α factor, which partly counters the positive α factor resulting from the patent septum.

If these variables are considered, it will be noted that some are capable of being influenced by the anæsthetist in such a manner as to reduce the degree of cyanosis. The rate of utilization of oxygen by the tissues depends upon the metabolic rate of the patient. By suitable sedation this can be lowered, and it is found that under the influence of morphine the colour of the patient improves, in spite of the resultant respiratory depression. Further, during anæsthesia, by the use of controlled respiration the metabolism of the patient can be reduced still further below basal levels, as with this technique all activity of the striated muscles except that of the heart is abolished. With controlled respiration respiratory depression due to the anæsthetic drug is countered, so that normal pulmonary ventilation is maintained. When cyclopropane is used as the anæsthetic agent it is possible to raise the partial pressure of oxygen in the pulmonary alveoli from the normal figure of 105 millimetres of mercury to at least 550 millimetres of mercury and probably considerably higher. It would appear, therefore, on theoretical grounds that the cyanosis of these patients would lessen during anæsthesia, and in practice this is the case.

Blalock and Taussig have stated that variations in the α factor in patients with polycythæmia are due to secondary changes in the lungs, as the result of which all blood passing through the pulmonary capillaries is not in effective contact with the alveolar oxygen. This is not a correct interpretation of the statements of Lundsgaard and Van Slyke. The factor that is involved in these changes is the permeability of the pulmonary alveolar membranes to oxygen, and these workers can find little evidence supporting the theory that changes take place in these membranes. They refer to the "pneumonosis" of Brauer, but conclude the section with the following sentence:

> Whether a pathologically lowered diffusion constant for the alveolar membranes ever actually occurs is therefore not yet directly shown.

It is true, however, that in a person with a normal hæmoglobin value blood leaving the lungs is 95% saturated with oxygen, and any raising of the partial pressure of that gas in the pulmonary alveoli will result in little increase in the percentage saturation of the blood. In the presence of polycythæmia the blood leaving the lungs is not saturated so fully and prolonged inhalation of oxygen will produce a rise in the percentage saturation. This holds for patients suffering from Fallot's tetralogy, so that if during anæsthesia a high partial pressure of oxygen is employed, the oxygen content of the blood leaving the lungs is raised.

In Table I the blood estimations obtained from a normal person are compared with those of a patient suffering from typical Fallot's tetralogy.

TABLE I.

Estimation.	Normal Subject.	Patient with Tetralogy of Fallot.
Hæmoglobin value (grammes per 100 millilitres of blood)	15	22·5
Red blood corpuscles per cubic millimetre of blood	5,000,000	10,200,000
Oxygen capacity of blood (volumes *per centum*)	20	30
Arterial blood:		
Oxygen content (volumes *per centum*)	19	11
Oxygen unsaturation (volumes *per centum*)	1	19
Percentage saturation	95	37
Oxygen tension (millimetres of mercury)	100	40
Carbon dioxide content (volumes *per centum*)	50	29
Venous blood:		
Oxygen content (volumes *per centum*)	14	9
Oxygen unsaturation (volumes *per centum*)	6	21
Percentage saturation	70	30
Oxygen tension (millimetres of mercury)	40	30
Capillary blood:		
Oxygen content (volumes *per centum*)	16·5	10
Oxygen unsaturation (volumes *per centum*)	3·5	20
Percentage saturation	82·5	33

The figures quoted above in Table I are for a case of Fallot's tetralogy when the readings are taken with the patient at rest. But on exercise there is a fall in the arterial oxygen content to as low as seven volumes *per centum*, and in the percentage saturation of the arterial blood to 23. At this saturation the tension of oxygen in the arterial blood may be as low as 20 millimetres of mercury.

So far the factors governing cyanosis have been discussed; but, from the viewpoints of the patient and of the anæsthetist, those which influence anoxia are of much greater importance. In the person whose blood has a normal hæmoglobin content, the degree of anoxia is indicated by the depth of cyanosis. It must be remembered, however, that, whereas cyanosis depends on the absolute amount of reduced hæmoglobin in the capillary blood, anoxia depends upon the oxygen tension, and hence upon the percentage saturation. Whilst cyanosis is greatly

influenced by the hæmoglobin content of the blood, anoxia bears only slight relationship to it. When the hæmoglobin content is normal, the oxygen tension of the arterial blood is 100 millimetres of mercury and the percentage saturation 95. In the patient suffering from Fallot's tetralogy, in which the percentage saturation of the arterial blood is low, usually there is an attempt on the part of the body to compensate for this by the production of polycythæmia and by raising the hæmoglobin content of the blood. This mechanism is successful only in part, since the tension of oxygen in the arterial blood depends on the solubility of the gas in the plasma and not on the hæmoglobin content. To increase the hæmoglobin value renders the dissociation curve of oxyhæmoglobin more S-shaped and thereby raises the oxygen tension for a given percentage saturation, but not to a value approaching normal. More oxygen is carried to the tissues by the excess hæmoglobin; but the tension of the gas is so low that it is of little value in preventing anoxia. Whilst the patient is at rest and the demand for oxygen by the tissues is minimal, the tension may be adequate; but when the requirements rise during exercise, severe anoxia is precipitated. Unconsciousness occurs in a patient when the oxygen tension of the arterial blood falls below 35 millimetres of mercury. In cases of Fallot's tetralogy, the value at rest is about 40 millimetres of mercury, and exercise lowers it sufficiently to pass below the critical level. These patients are constantly anoxic and become dangerously so on exertion. During anæsthesia it is essential that the rate of utilization of oxygen by the tissues should be maintained at a low level and that the aeration of the blood passing through the lungs should be as complete as possible. Only when these conditions are fulfilled will the anæsthetist carry the operation to a successful conclusion.

The arterial oxygen tension in these patients is such that the respiratory centre is greatly influenced by the carotid and aortic reflexes, the chemoreceptors of which are stimulated by severe anoxia. The degree of anoxia necessary to initiate these reflexes is such that the oxygen tension of the arterial blood must be below 70 millimetres of mercury.[4] In the cases under discussion the oxygen tension frequently lies below 40 millimetres of mercury when the patient is at rest and falls as low as 20 millimetres of mercury on exercise. The respiratory centre therefore is functioning in an abnormal manner, the control being reflex from stimulation of the carotid and aortic chemoreceptors, rather than directly chemical from stimulation of the centre by carbon dioxide. Hyperpnœa results and the carbon dioxide content of the arterial blood falls below normal—a condition which further embarrasses the patient as the dissociation of oxyhæmoglobin is hindered and the oxygen supply to the tissues further reduced.

Anæsthesia.

When the decision was made to undertake the surgical treatment of patients suffering from Fallot's tetralogy, the choice of anæsthetic agent and technique was considered with the foregoing facts in mind. Premedication with morphine was used with the object of lowering the metabolic rate. Atropine was included in the premedication, in spite of its reverse action, owing to the desirability of suppressing secretions in the pharynx. Cyclopropane was administered as the main anæsthetic agent, firstly as it made possible the use of a high partial pressure of oxygen, and secondly as controlled respiration is easier with this drug than with ether. In the hands of Harmel and Lamont the best results have been achieved with cyclopropane. Curare was employed as an adjuvant to anæsthesia in order to control coughing reflexes and to allow extremely light planes of anæsthesia to be entered. Control of respiration was established as soon as the larynx had been intubated, and was maintained throughout. In this way adequate pulmonary ventilation was possible in the presence of an open pneumothorax. Further, it was considered that, since the respiratory centre in these patients functioned in an abnormal manner, it was preferable to abolish voluntary respiration.

Reports of Cases.

CASE I.—This patient was a male child, aged eighteen months and weighing 22 pounds. The hæmoglobin value was 15 grammes *per centum* and the red blood cells numbered 8,300,000 per cubic millimetre. Cyanosis was present when the child was at rest, becoming deeper when he cried. For premedication the baby was given one forty-eighth of a grain (1·5 milligrammes) of morphine and one two-hundredth of a grain (0·3 milligramme) of atropine, both administered hypodermically. Anæsthesia was induced with cyclopropane, an infant mask and soda-lime canister being used, the latter having a dead-space volume of 15 millilitres. As soon as consciousness was lost a cannula was inserted into an arm vein and an infusion of normal saline solution was commenced. "Tubarine" (two milligrammes) was added to the infusion and the larynx was intubated with a compound Magill catheter, size 1 to 3. This catheter fitted the larynx so that no further form of sealing was needed. The compound nature of the catheter prevented bronchial intubation. "Pentothal Sodium" (0·1 gramme) was introduced into the saline infusion, and a mixture of 10% of cyclopropane and 90% of oxygen was run into the bag of the anæsthetic machine. Controlled respiration was then established and maintained throughout the operation. "Tubarine" (two milligrammes) was administered after thirty minutes, and one milligramme more was given after a further fifty minutes. No disturbance of pulse rate and blood pressure or change of colour was encountered at any stage. The intravenous infusion was changed to blood when the anastomosis was begun, and a total of 250 millilitres of blood was given.

Anæsthesia lasted for three and a half hours and was uneventful, the baby being conscious within thirty seconds of the insertion of the final suture. The patient was returned to bed receiving oxygen administered with a naso-pharyngeal catheter; but a change was made to an open-top tent after twelve hours as the catheter disturbed the child. An oxygen concentration of 65% was maintained for three days and then gradually reduced until atmospheric conditions were reached, when it was discontinued. There was no post-anæsthetic vomiting, and the child commenced to take nourishment within a few hours of operation.

CASE II.—This patient was a female child, aged seven years and weighing two stone twelve pounds. The hæmoglobin value was 27 grammes *per centum* and the red blood cells numbered 10,200,000 per cubic millimetre. Cyanosis was intense, the ears and nose being the colour of ripe mulberries and the conjunctivæ suffused. The child was dyspnœic at rest and was unable to speak more than single words without resting for breath. On crying, the child became black and lost consciousness.

Premedication consisted of one-eighteenth of a grain (3·5 milligrammes) of morphine and one one-hundred-and-fiftieth of a grain (0·4 milligramme) of atropine administered hypodermically. The child arrived in the operating theatre quite placid and less cyanosed than on any previous occasion. Anæsthesia was commenced by allowing nitrous oxide to drift down onto the face of the child. When consciousness was obliterated, a change was made to cyclopropane, and an infusion of normal saline solution into an arm vein was commenced. "Tubarine" (six milligrammes) was given into the infusion and the larynx was intubated with a Magill catheter (size 3) fitted with an inflatable cuff, which, however, was left collapsed. "Pentothal Sodium" (0·15 gramme) was then given into the infusion and the bag of the anæsthetic machine was filled with gas mixture containing 10% cyclopropane and 90% oxygen. Controlled respiration was commenced and maintained throughout the operation. The colour of the patient still further improved with the induction of anæsthesia and the institution of control, remaining so until the heart and great vessels were handled by the surgeon. A rise in the pulse rate of 20 beats per minute then occurred and the colour of the patient became black. A pause was made in the operation, the retractors were removed from the chest and the lung was reexpanded; but after a minute's wait there was no obvious improvement in the colour, even when the patient was receiving 100% oxygen. It was decided to continue the operation in spite of the cyanosis, and the right pulmonary artery was occluded as the next operative step. The colour of the patient immediately improved and the pulse rate returned to its previous value. Anæsthesia was continued by means of a 5% cyclopropane mixture. Injections of "Tubarine" (two milligrammes) were given into the infusion at intervals of thirty minutes, a total quantity of fifteen milligrammes being used during three hours' anæsthesia. Blood was substituted for saline solution when the arterial anastomosis was begun, a volume of 250 millilitres being administered. With a degree of polycythæmia

such as this patient showed, serum or plasma would have been preferred, but was not available. It must be remembered, however, that the donor blood contained only one-half the volume of red cells that was present in the spilled blood of the recipient. At the termination of the operation consciousness was regained rapidly, and the patient returned to bed receiving oxygen through a naso-pharyngeal catheter. This was changed to tent administration, with carbon dioxide absorption and ice control of humidity, after about one hour. There was no post-anæsthetic vomiting and the child consumed large volumes of fluid during the next forty-eight hours. This suggested that hæmodilution was taking place, which is the reverse process to that occurring during acclimatization to low oxygen tensions. This was confirmed by the fact that the cyanosis vanished within twenty-four hours and the polycythæmia decreased very rapidly. On the day after operation the child was indistinguishable from a normal individual.

Summary.

The problems of anæsthesia in the surgical treatment of Fallot's tetralogy are discussed with special reference to the factors influencing cyanosis and anoxia in these cases. The choice of anæsthetic agent and technique is considered, and two cases are described in which success was achieved in establishing an artificial communication between the pulmonary and aortic circulations.

References.

(1) M. H. Harmel and A. Lamont: "Anesthesia in the Surgical Treatment of Congenital Pulmonic Stenosis", *Anesthesiology*, Volume VII, 1946, page 477.
(2) A. Blalock and H. B. Taussig: "The Surgical Treatment of Malformations of the Heart", *The Journal of the American Medical Association*, Volume CXXVIII, 1945, page 189.
(3) C. Lundsgaard and D. D. Van Slyke: "Cyanosis", *Medicine*, Volume II, 1923, page 1.
(4) C. H. Best and N. B. Taylor: "The Physiological Basis of Medical Practice", Third Edition, 1943, page 573.

Addendum.

Since the above material was prepared, a further nine patients suffering from the tetralogy of Fallot have been operated upon at the Alfred Hospital. The method of anæsthesia differed in no way from that described. Serum was used in place of saline solution during the early part of the operations and blood was substituted when the anastomoses were commenced. In view of the thirst in the previous case, the patients were returned to bed with the infusion cannula still in the vein, and one litre of 5% dextrose solution was administered during the immediate post-operative period.

CORNEAL TRANSPLANTATIONS.

By PETER B. ENGLISH,
Brisbane,
and
J. McBRIDE WHITE,
Melbourne.

IN the operation of corneal transplantation or keratoplasty, the scarred cornea which is obscuring the vision is replaced by a window of clear cornea.

A survey of medical literature reveals that only one case of corneal transplantation has been reported in Australia, being that of Gibson[1] in 1941.

Corneal transplants may be (*a*) autotransplants (in the same individual), (*b*) homotransplants (in the same species), and (*c*) heterotransplants (between species—for example, from cat to man). The first and second types are equally satisfactory, but heterotransplants always become opaque after a short period.

Transplants may be classified in two ways: (*a*) by surface area, (*b*) by depth. According to area they are total if the entire cornea is replaced and circumscribed, or partial if only a portion of the cornea is utilized. When depth is considered the transplant is lamellar if only the superficial layers are replaced and penetrating if the full thickness of the cornea is transplanted. Hence there are four types of keratoplasty: (i) total lamellar, (ii) circumscribed lamellar, (iii) total penetrating, (iv) circumscribed penetrating. Lamellar keratoplasty is a conservative measure; but since a slight layer of scar tissue forms between the old and the new lamellæ, the visual result is not so satisfactory as that following a full-thickness corneal transplant. Total penetrating keratoplasty, involving the replacement of the entire cornea together with a fringe of conjunctiva and perhaps the sclera, has been attempted on many occasions, but the permanent results have not been good and enucleation has frequently been necessary at a later date. At the present time the most popular operation is a circumscribed penetrating keratoplasty, and in this procedure a window about four to six millimetres in width is cut through the full thickness of the opaque cornea and replaced with a similar portion of clear cornea from another eye. Numerous methods of transplantation to both animals and human beings have been attempted by many surgeons during this and the last century. The first recorded case on a human being is that of Kissam in 1838, who used as donor material the cornea of a young pig.

Methods of Operation.

There are three main methods in use at the present time, those of Castroviejo, of Thomas, of Filatov.

Castroviejo[2] uses a twin-bladed knife to outline the site of the graft, and the eye is then stained with fluorescein to facilitate the succeeding stages of the operation. Figure-of-eight sutures are next inserted about two millimetres outside the scars. The keratome is now used to enter the anterior chamber and is placed so as to cut through one of the corners of the graft. Through this opening the special scissors are passed into the anterior chamber and the cornea is bevelled by the operator's holding the blades about 20° away from the perpendicular. Tension meantime is maintained by a suture previously inserted into the scarred cornea which is being removed. By means of the same instruments a similar piece of cornea is now removed from the donor eye and placed in the opening from which the opaque cornea has been removed. The sutures are then gently tightened so as to hold the graft in place.

Thomas[3] uses a trephine with a diameter of 4·5 millimetres for the donor eye and 4·6 millimetres for the recipient eye, and the cut is made two-thirds of the way through the cornea and then continued at an angle so that an oblique penetration is made on one side. The removal of the graft is completed with scissors held in such a way as to cause a slight bevel; the graft is then placed in the opening and this is retained by a cross-stitch inserted into the cornea.

The Filatov[4] operation is as follows. A puncture and counter-puncture are made in the cornea and a strip of celluloid is passed through these and so through the anterior chamber. The reason for the prophylactic insertion of the spatula is to prevent, or at any rate to minimize, damage to the iris and to the lens. Perritt[5] states that Filatov has modified his operation several times and has now abandoned the prophylactic insertion of this strip. He then uses a trephine to perform the graft, which is retained by corneal stitches.

A method of cutting a corneal graft by the introduction of a punch into the anterior chamber through an incision near the periphery of the cornea has been introduced by Weiner and Alvis,[6] and good results have been claimed.

Indications.

The cases in which corneal transplantations are likely to give a permanent improvement to the vision are those in which the following conditions are fulfilled: (i) there is no increase in intraocular tension; (ii) the diseased ocular tissue is confined to the cornea; (iii) the leucoma does not cover the whole cornea; (iv) there are comparatively clear areas around the proposed site of the graft.

The unfavourable cases are of four types. The first is that in which dense corneal opacities are present,

extending over the whole or almost the whole of the cornea. In these cases it would not be possible so to place the graft as to have clear areas around it. The second type is that in which the eye is aphakic. The third contraindication is increased intraocular tension, and the fourth is pronounced vascularization of the cornea.

Preliminary Operations.

Preliminary operations are sometimes required to prepare the eye for the transplantation. For instance, preliminary iridectomy is often performed when the pupil does not dilate fully, and synechiæ should be removed where possible. In cases in which the whole cornea is opaque a series of transplants may be necessary to replace the densest scar tissue, and then the last corneal transplantation for visual purposes.

Donor Material.

A suitable eye from which to obtain a corneal transplant is one which has been enucleated for pathological changes which do not involve the cornea, the eye of a younger person being preferable to that of an older one. Vasserman[7] belongs to the school of thought which maintains that cadaver cornea is superior to that obtained from other sources. In support he states that "the conserved cornea is the best material for corneal transplants". Undoubtedly successful transplantations of material from cadavers have been reported from all parts of the world. Castroviejo[8] stresses the importance of having fresh material, from whatever source it may be obtained. He states that within twenty-four hours after death it is possible to obtain good corneal grafts from cadavers preserved at low temperatures, but it is not advisable to use them after twenty-four hours because of the occurrence of corneal changes. He makes the following statement: "Grafts obtained from eyes of the stillborn, from infants or cadavers will give as good results as grafts obtained from eyes enucleated shortly before the performance of the keratoplasty only when the cornea has not undergone changes detectable by clinical or microscopic observation." Other authorities, including Fine,[9] maintain that corneal tissue from an eye recently enucleated for disease is better material than that obtained from the cadaver.

The consensus of opinion appears to be that if cadaver material is to be used the eye should be removed within a few hours of death, and the best results are to be expected if the operation is not delayed for any longer than twenty-four hours after the material is obtained.

In general it may be stated that a young eye appears to be more suitable than an old one, in which degenerative processes may have taken place.

Post-Operative Treatment.

After the operation the patient is given adequate sedation so as to ensure a quiet convalescence. The first dressing is done at the end of forty-eight hours, and dressings are done every day thereafter. Atropine (1% drops) is instilled daily, the sutures are removed on about the seventh day and the bandages after a period of about fourteen days. The transient œdema of the graft passes off during the first couple of weeks, and at the end of one month union is firm. In unfavourable cases a graft usually takes, but soon becomes cloudy on account of vascularization and of changes occurring deep in the corneal tissue.

When the war commenced it was thought that with the occurrence of burns to the face and eyes, in a number of blinded men the damage would be confined to the cornea and some of these would prove suitable for corneal transplantation. As far as the Australian forces were concerned this did not prove to be the case. Major L. Duncan,[co] at that time adviser in ophthalmology to the Australian Military Forces, in a personal communication has informed us that the case reported here was the only one in any of the three branches of the Australian fighting forces.

Since the conclusion of hostilities several men have been sent to England, some for training at Saint Dunstan's Hospital and others for advice and treatment from ophthalmologists in England, including Tudor Thomas. One of these, Stoker D.J., was a member of the crew of His Majesty's ship *Perth*, which was sunk in 1942, and he was taken prisoner by the Japanese. When he was released after the war he was found to have a central corneal opacity and his vision was so poor that ophthalmologists in Melbourne recommended that he be sent to England with a view to having a transplantation. According to the information supplied by the man himself, Tudor Thomas did not consider this advisable, and a wide iridectomy was performed. His vision at the present time is in the vicinity of $^3/_{60}$, but in his case there may be the complicating factor of retrobulbar neuritis, so common among those who were prisoners of war of the Japanese. Captain E.B., who was injured by a bomb explosion, sustained the loss of one eye, and the other had a dense opacity at the centre of the cornea. In his case the lens was also damaged and probably the retina. He also went to England, but unfortunately a corneal transplantation was not successful in restoring his vision, as the retina had been too badly damaged. It is possible that others have had corneal transplantations since the cessation of hostilities, but these have not come under our notice.

Report of a Case.

A Sepik River native, Warrant Officer Y., came under our care in 1945. Unfortunately all his medical records had been lost and were not recovered during the period he was in our care. He spoke only pidgin English, but the history he gave was that four months previously he had been burned by a phosphorus bomb, which had been used in mistake for a smoke signal. He had considerable scarring due to burns on the front of the chest, arms, face and eyelids, and the right upper extremity had been amputated about the middle of the forearm.

On examination of the patient the findings were as follows. When the right eye was investigated the lids were found to be considerably scarred, and there was a dense scar involving the upper and central portions of the cornea. The lower and nasal section of the cornea was not so densely scarred, but was not sufficiently clear to warrant the performance of an iridectomy for optical purposes. Examination of the iris revealed some adhesions, especially in the upper portion of the pupil, but the tension was normal. He could distinguish hand movements at one metre. The lens could not be examined satisfactorily on account of the density of the corneal scar, but lens changes were suspected and possibly retinal damage from the explosion. The left eye had doubtful perception of light and a dense, marble-like corneal opacity involving the whole of the cornea, and in fact it was difficult to tell where cornea finished and sclera began. Practically the whole of the lower lid had been destroyed by the injury received at the time of the accident.

Corneal transplantation seemed the only hope of improvement, and inquiries were made among our colleagues as to the likelihood of the enucleation of an eye whose disease processes did not involve the cornea. There did not appear to be any impending, and it was decided to use the eye from a cadaver when a suitable one was available. Meantime, penicillin drops were being used in order to clear up any infection in the right eye. Finally the eye was free from infection, and at this stage the patient was taken into the operating theatre on several occasions, being carefully draped, and numerous manipulations were carried out to the eye so as to accustom our native patient to theatre environment and procedure.

Shortly after this a young soldier, aged twenty-four years, who had been badly injured in a motor smash, finally succumbed early one morning. Some considerable delay ensured before contact could be made with the relatives to obtain their permission to remove the eye. As it was an accident case, the permission of the coroner also had to be obtained before the eye was finally removed, about seven hours after death. After the removal of the eye the cornea was carefully examined with the loupe (no slit-lamp being available), and as no defects could be seen it was evident that this would be a suitable donor eye and the operation would be proceeded with. The eye was then placed on gauze saturated with saline solution and kept at a temperature of 2° C.

Operation was commenced about three hours after the eye had been removed, and as doubt still existed as to the behaviour of our patient under local anæsthesia, resort was had to the use of "Pentothal" given intravenously. The technique of Castroviejo was employed, except that we removed the graft from the donor eye before opening the recipient eye. Using a twin-bladed knife, one of us (P.B.E.)

made an incision about half-way through the recipient cornea, which was then stained with fluorescein so as to show up clearly the lines of the incision. At this stage the figure of eight sutures were inserted about 1·5 millimetres outside the scars in the manner prescribed by Castroviejo. The loops were drawn well back so as to minimize the risk of their being cut in the subsequent stage of the operation. Next, with the twin-bladed knife and the special keratome and scissors of Castroviejo, a four-millimetre square of cornea was removed from the donor eye. This was then placed in saturated saline gauze, care being taken that the outer and inner sides were not reversed. During this portion of the operation the donor eye was steadied in an acryllic container which the dental department of 102 Military Hospital had ingeniously provided for us. The incisions into the scarred recipient cornea were now completed and the square was removed. The degree of thickness of this cornea following the phosphorus burns was very pronounced and we estimated that it must have been in the vicinity of three millimetres, as opposed to the normal of about one millimetre. Wolfe[11] describes the anterior chamber as being about three millimetres in depth, and so the thickening had caused great shallowing of the anterior chamber.

This degree of thickening made it difficult to get the right amount of bevelling, and the angle at which the instruments were held had to be brought closer to the perpendicular; otherwise the opening through the inner border of the cornea into the anterior chamber would have been too small. After the square was removed, the edges being bevelled in the process, the graft of clear cornea was slid in and the sutures were tied. The bandages were applied and heavy sedation was given, and the first dressing was not done for forty-eight hours. Thereafter dressings were done daily, atropine drops being instilled and also penicillin drops of a strength of 1000 units to the millilitre. The sutures were removed on the sixth day and the graft then appeared to have taken well. After that the patient made an uneventful recovery, and later had a plastic operation to restore the lower lid to the left eye. At the end of two months the graft showed some cloudiness in the periphery, but the centre was clear.

As this man could not read letters it was difficult to assess his visual acuity, but when he was last examined in January, 1946, some two months after his operation, his visual acuity was in the vicinity of $^{6}/_{36}$. In view of the density of the scarring of the cornea and the probability of damage due to the explosion, we considered this satisfactory. Since he returned to New Guinea he has not been examined by an ophthalmologist; but a report has now come to hand through the army authorities which indicates that he is still able to see his way round satisfactorily. To have vision sufficient to get about means much to man in civilized conditions, but to one living in the jungle of New Guinea it means a good deal more.

Comment.

Castroviejo[12] in a personal communication gives it as his opinion that if a graft remains transparent for a period longer than six weeks it will probably remain permanently transparent. Now after a period of two years has elapsed it seems that the patient has a permanent result, and it is unlikely that any further opacification will take place. Castroviejo and others have pointed out that there is no need for the donor and recipient to belong to the same blood group, nor for them to be of the same race and colour. It has been recorded that white and Negro corneæ are interchangeable and our case supports this statement. It is probably the first occasion on which a corneal transplant has been performed on a New Guinea native. It was particularly fitting that the operation was successful in the case of Warrant Officer Y., because he was a very brave man and intensely loyal to the cause of the white man. His gallant service has earned for him both the Loyalty Medal and the Distinguished Conduct Medal.

Acknowledgements.

We are indebted to a great many people, former members of the staff of the 102 Military Hospital, and also to the patients of the eye ward, who did so much to make conditions more congenial to the native patients. We desire to express our thanks to Major John Oldham, our anæsthetist; to Major John Perry for advice in pathology and experimental animals; to Major MacDonald Smith and Staff Sergeant J. Melloy, of the dental department, for fashioning the acryllic mould to hold the eye; to Dr. John Legg, Director of the Veterinary Science Institute; to Sister D. Coleman and Sister M. L. Wells, of the ward staff; to Sister Crozier and Sister F. Kavanagh, of the operating theatre staff; to Lieutenant J. Mcrae Fraser, our optometrist; to Sergeant H. McIlquham; to Private Hazel Lamb; to Mr. Keith Auld for supplying animal eyes; and to many others who were of great assistance.

We desire also to thank Colonel F. Garrett Scholes, commanding officer of 102 Military Hospital, and Colonel K. B. Fraser, the Deputy Director of Medical Services of Queensland Lines of Communication Area, who took a great interest in the case and assisted us in many ways. We desire also to thank our fellow ophthalmologists, Major L. Duncan, Dr. K. O'Day, of Melbourne, Dr. R. Pittar and Dr. A. L. North, of Sydney, and Captain H. Truett, of the United States Army, for information supplied. Our special thanks are due to our colleague Dr. E. J. McGuinness, of Brisbane, for the loan of instruments and for valuable advice in regard to the operation. Our thanks are due to the Director-General of Medical Services for permission to publish this paper.

Summary.

1. A brief review of the methods of corneal transplantation is given.

2. A successful case of corneal transplantation is reported.

3. This was the only operation of this kind performed in the Australian fighting forces during the second world war.

References.

(1) W. L. Gibson: "Corneal Graft from the Cadaver", THE MEDICAL JOURNAL OF AUSTRALIA, Volume II, 1941, page 628.

(2) R. Castroviejo: "Keratoplasty", *American Journal of Ophthalmology*, Volume XXIV, 1941, page 17.

(3) J. W. T. Thomas: "The Technique of Corneal Transplantation with Recent Modifications", *Transactions of the Ophthalmological Society of the United Kingdom*, Volume LVII, 1937, page 520.

(4) V. P. Filatov: "Transplantation of the Cornea", *Archives of Ophthalmology*, Volume XIII, 1935, page 321; quoted by R. Castroviejo, *loco citato*.[2]

(5) R. A. Perritt: "Corneal Transplantation", *Archives of Ophthalmology*, Volume XXX, 1943, page 14.

(6) M. Weiner and B. Y. Alvis: "Transplantation by Means of Mechanically Obtained Beveled-Edge Segment", *American Journal of Ophthalmology*, Volume XXIII, 1940, page 887.

(7) I. Vasserman: "Transplantation of the Cornea of the Cadaver", *Vestnik oftalmologii*, Volume XIV, 1939, page 10; quoted by Fine, *loco citato*.

(8) R. Castroviejo: "Keratoplasty", *American Journal of Ophthalmology*, Volume XXIV, 1941, page 31.

(9) M. Fine: "Homo Transplantation of Preserved Cornea. Experimental Study", *American Journal of Ophthalmology*, Volume XXIII, page 1140.

(10) L. Duncan: Personal communication.

(11) E. Wolff: "Anatomy of the Eye and Orbit", page 62.

(12) R. Castroviejo: Personal communication, January 28, 1946.

A NOTE ON THE ROYAL ARMY MEDICAL CORPS.

By A. M. McINTOSH,

Colonel, Australian Army Medical Corps, Sydney.

SIR JAMES MCGREGOR, who was Wellington's senior medical officer and was Director-General of Medical Services until 1850, is generally credited with having established the army medical service of the British Army as a definite and essential entity. In earlier days the sick and wounded had in the main to fend for themselves. McGregor introduced various reforms, of which the chief was the establishment of field hospitals, but the forty years' peace that succeeded Waterloo had resulted in a marked deterioration in general army administration, in which the medical services shared. There was no recognized medical corps. The medical officer wore the uniform of the regiment to which he was attached; he with the

bandsmen was responsible for the collection of wounded and for their transport to the regimental hospital—frequently merely a small tent with no medical equipment. Evacuation to hospitals in the rear was one of the functions of the Land Transport Corps, without any special priority. The medical officer had no control, no authority or any responsibility except for medical treatment.

The British army medical service lagged far behind that of some of the Continental nations, notably the French, where already in Napoleon's day Larrey had introduced the "flying ambulance" and Percy the stretcher-bearer. The regimental hospital was the basis of the army medical scheme. Even in garrisons there were multiple hospitals—one for each unit.

At the outbreak of the Crimean War the "Army Conveyance Corps" was sent to Turkey to evacuate wounded and to provide orderlies for field hospitals. This unit was short-lived. It was composed of pensioners and other ineffectives who were old, untrained and intemperate, and after a few months it was replaced by the first "Medical Staff Corps", composed of nine companies, each of 78 men, "to be employed in any way that may be required in the performance of hospital duties". This unit did not last long. The men who composed it were really civilians with a quasi-military status; neither officers nor their subordinates had any disciplinary powers and the personnel were almost entirely untrained. It is not difficult to understand, therefore, why the medical arrangement in the Crimea completely broke down. When the serious situation was appreciated in England, Florence Nightingale was sent to Scutari, where she found inefficiency and confusion beyond description: thousands of closely packed beds in insanitary and verminous buildings, a lack of essential nursing and medical equipment, poor cooking facilities, no provision for laundry, absence of all ordinary amenities, inadequate and untrained staff. Small wonder that in two years deaths from wounds were 1700, from disease 17,000. With the aid of her associate nurses and the large sums of money subscribed for her use, but above all by her tireless and indomitable spirit, Miss Nightingale worked wonders in improving the lot and particularly the morale of the unfortunate patients. When they were hungry she gave them food they could eat; when they were literally naked she clothed them; and throughout she disregarded routine and regulation when they hindered her and pushed aside higher authority, however exalted, when it stood in her path. This she could afford to do because she had the backing of the Home Government.

Once the war was over a Royal Commission to inquire into the health of the troops was inevitable, particularly when it was found that the mortality of troops in barracks in peace-time was twice that of the civil population. Miss Nightingale took a leading part in determining the terms of reference of the commission and its constitution; Sydney Herbert, her greatest friend, who had been in the Cabinet and at the War Office, and who had sent her to Scutari, was chairman. Her sex made it impossible for her to appear before the commission, but she, to a large extent, directed its proceedings, and its report embodies suggestions based on her voluminous "Notes Affecting the Health, Efficiency and Hospital Administration of the British Army". It only remained to ensure that the commission's recommendations were implemented. This meant a further sustained effort carried on with a persistence, tenacity and fighting spirit quite unlike the popular conception of the gracious "Lady of the Lamp". However, Palmerston's Government fell, Herbert was once more Secretary of State for War and the fight was over.

Army hospitals were established at Chatham and Netley. The latter became an army medical school. Medical officers were given improved status and increased pay. Prevention of disease was established as at least as important as the healing of the sick. Amenities were provided for relaxation and recreation, and army medical administration was completely reorganized.

Already the Medical Staff Corps had been replaced by the Army Hospital Corps with a definite military organization. It was recruited from men of the line regiments of good character and of at least two years' service. These were given special training in general hospitals. The greatest defect in the scheme was the retention of the regimental system, which persisted until 1873. In that year garrison hospitals replaced multiple unit hospitals, but separate wards were usually still allotted to units and the sick remained, as far as possible, in the care of their own medical officers. All medical officers were posted to a newly formed Army Medical Department. The Army Hospital Corps was strengthened and developed to carry out all hospital duties. Captains and lieutenants of orderlies were appointed from the non-commissioned officers. (In 1881 they became quartermasters.) A medical officer attached to each regiment or equivalent unit was made responsible for the training of his sixteen stretcher-bearers. A further epoch in army medical evolution was marked by the establishment of bearer companies. The first was formed in Africa in 1879 by Surgeon-Captain Hector in the Sekukuni campaign against the Kaffirs. It was organized from infantry, army hospital corps and natives. The formation of the second bearer company in England in 1880 and its utilization in the Boer War were considered of sufficient importance to call for a pronouncement in the House of Commons from Colonel Stanley, Secretary of State for War, that this was a "marked feature in field organization". Surgeon Major Evatt wrote: "I claim for the bearer company that it is the very best and most useful outcome of modern humanity in dealing with the wounded in war." The proposed strength of a bearer company at this stage was eight officers and 200 other ranks from Army Hospital Corps and Army Service Corps drivers. Thirty-three ambulances were allotted to each company.

The granting to medical officers in 1877 of powers of command over Army Hospital Corps, patients in hospital and personnel attached was a further step, which was implemented very gradually in face of considerable resistance in high places. In 1884 the medical officers of the Army Medical Department and the quartermasters of the Army Hospital Corps were grouped together as Army Medical Staff and the name of Army Hospital Corps was changed to Medical Staff Corps. The strange reluctance to regard army medical officers as soldiers, which has persisted until quite recent days, found a further expression in 1887, when the "relative rank" granted to them was abolished and they reverted to what was practically civilian status—merely "ranking with" other officers of various grades. This retrograde step caused much discontent and interfered so seriously with recruiting that a Royal Warrant was promulgated in 1891 giving to medical officers substantive rank in other services, though with the prefix "surgeon". These titles carried precedence and other privileges attaching to the rank. These compound titles were never popular, but persisted until 1898, when the Medical Staff Corps and the Army Medical Staff were combined to form the Royal Army Medical Corps. Bearer companies and field hospitals retained their independent identity throughout the Boer War, but as a result of the reorganization which followed its conclusion they were united in the Royal Army Medical Corps to form a single unit—the field ambulance—and this reform was implemented in the Australian Army Medical Corps in 1906.

Bibliography.

G. A. Kempthorne: "Notes on the History of the Medical Staff Corps and the Army Hospital Corps", *Journal of the Royal Army Medical Corps*, Volume LI, 1928, page 265.

J. T. Fotheringham: "Notes on the British Medical Service", *Journal of the Royal Army Medical Corps*, Volume XXII, 1914, page 521.

S. F. Clark: "Looking Backward", *Journal of the Royal Army Medical Corps*, Volume IX, 1907, page 193.

Hector: "The First Bearer Company", *Journal of the Royal Army Medical Corps*, Volume XVI, 1911, page 653.

Johnston: "The Second Bearer Company", *Journal of the Royal Army Medical Corps*, Volume XVII, 1911, page 412.

G. J. H. Evatt: "Bearer Company", *Journal of the Royal Army Medical Corps*, Volume IX, 1907, page 193.

Arnold Chaplin: "Early History of the Royal Army Medical Corps", *British Medical Journal*, Volume II, 1918, page 675.

J. B. Hamilton: "The Royal Army Medical Corps, Past, Present and Future", *British Medical Journal*, Volume II, 1900, page 630.

Douglas Guthrie: "A History of Medicine", 1945, page 346.

Reviews.

EYE NURSING IN CHILDREN.

"CHILDREN'S EYE NURSING", by J. H. Doggart, is a readable little handbook with much information in its 135 pages.[1] It is written from a wealth of clinical experience; any personal views of the author must command respect.

For removing the crusting of blepharitis he advises hydrogen peroxide (ten volumes in strength). This is followed by *"Liquor Tinctorium"*, which is a proprietary preparation containing a mixture of dyes, and which stains the eyelids violet. In congenital lachrymal obstruction he prefers to wait, if possible, until the child is a year old in the hope of a spontaneous cure. He gives a warning against over-treatment of styes. Fomentations and hot bathing are harmful if excessive; he does not like epilation of a lash.

He trips on the spelling of that tricky word "desiccated". His estimate of the value of orthoptic treatment for divergent concomitant strabismus is unduly pessimistic. On the subject of peeping, special mention should have been made of squinters. When having their vision tested these children will wriggle and dodge to see with the fixing eye. An unsuspecting nurse may easily be deceived into recording a visual acuity of $^6/_6$ for an eye which is hopelessly amblyopic.

The book is excellent for its purpose. Its small size will not frighten a nurse seeking ophthalmic knowledge, yet the information contained in it is adequate.

A TEXTBOOK OF SURGERY.

A THIRD edition of "The Essentials of Modern Surgery", edited by R. M. Handfield-Jones and A. E. Porritt, marks the first post-war appearance of this well-known textbook.[2] Written as it is by a team of London surgeons, though principally by the first-named editor, it may be expected to present to the student and young graduate a considered opinion as to the present state of surgery.

Beautifully produced and profusely illustrated, this large volume is a tribute to the printer's art. The indexing also is excellent, and in a careful reading only one typographical error was found. However, such undiluted praise cannot be paid to its textual content. With the passing of the "general" surgeon, the writing of a complete textbook of surgery is becoming very difficult. Even when, as in this book, some limitations are imposed on its content (the eye and anæsthetics have been excluded) and the help of colleagues is also sought, a certain lack of balance remains obvious. Moreover, in order that the text may be contained within reasonable bounds, an extreme preciseness of statement—a quality markedly deficient in this book—becomes essential.

But a still more fundamental defect needs emphasis.

In the preface of its first edition the aim of this book was stated as one in which surgical teaching was based on the fundamental principles of anatomy, physiology and pathology. Though this is a laudable aim, the object of a surgical textbook must be to relate these fundamental sciences to diagnosis, prognosis and treatment; and such a synthesis can be achieved only by the use of an acceptable theory as to how pathological states express themselves in symptoms and signs. In default of this, clinical surgery remains mere empiricism. This is the most serious failing in this book. Symptoms and signs are detailed in profusion; but no sound explanation is vouchsafed of why the underlying pathological state must express itself in a particular way. It is high time that English textbooks gave clinical science its rightful place alongside anatomy and pathology as one of the corner-stones of surgery.

The contents of this volume follow the usually accepted pattern. After chapters on inflammation and repair, and on infection and immunity, a good statement is contributed on venereal diseases. In the next chapter on wounds and burns, though wounds are dealt with adequately if empirically, certain statements on burns are open to serious objection. The advocacy of coagulation with tannic acid as the standard treatment of burns would seem a reversion to methods quite opposed to the general experience of the past ten years. The same may be said of the treatment advised for frostbite.

As might be expected in a textbook emanating from Saint Mary's Hospital, chemotherapy, and especially the use of penicillin, receives adequate attention, and everywhere throughout the book the modifications of treatment resulting from the proper use of antibiotics are stressed.

An excellent chapter on diseases of the chest was completed by Tudor Evans just prior to his lamented death, and illustrates the full and precise statement to be expected from such a specialist surgeon. In contrast, the consideration of chronic mastitis, and especially the advice as to treatment, is deplorable in a book intended for young medical men of limited experience.

The chapter on hernia is full and accurate, as are those on the urinary tract and on injuries and diseases of bones and joints.

Though the chapter on appendicitis is good, an almost complete absence of explanation of the production of abdominal symptoms may allow the student, unless otherwise informed, to accept as truth the statement in the discussion of chronic appendicitis that "similar attacks may be due to recurring appendicular obstructions without inflammation, in which the pains are commonly felt only in the right iliac fossa as sharp pricking pains of short duration". Since such neuralgic aches of emotional origin are well-nigh universal, the *furor operandi* that could result from the acceptance of this advice can scarcely be contemplated.

In the biliary system, too, there is a failure to stress the fact that primary gall-stones are the initiating factor of all subsequent gall-bladder disease, while chronic cholecystitis is credited with an array of symptoms to which it is certainly not entitled.

A poor chapter on diseases of the female genital tract is followed by a series of chapters on the skull and brain. While much of this presentation is good, the advice on the treatment of head injuries is open to criticism. If "even in mild cases every patient must be kept at rest for at least 28 days" in a darkened room, with the absence of noise, rigid exclusion of all visitors and prevention of worry, it is little wonder that "traumatic neurasthenia is a common and sometimes very troublesome result of head injury".

Though we have been critical of many details in this volume, nevertheless it can be readily admitted that it forms a remarkably complete statement of those pathological states classified under surgery. In preparation for a higher degree, and on the assumption that the examiners held the same views as the authors, a better textbook would be hard to find. But as a study in the principles of modern surgery the defects already enumerated are manifest. There is as yet no completely satisfactory single-volume textbook of surgery, and in our experience there has been only one, and that of transatlantic origin, which is superior to the book under review.

MEDICAL TREATMENT.

THE fact that five editions and a reprint have appeared within ten years vouches for the popularity of the most useful book "Vade Mecum of Medical Treatment" by W. Gordon Sears.[1] Whilst in size this book is rather small, yet it contains clear and concise directions for the treatment of all medical maladies which are listed alphabetically for quick reference. Naturally in such a small book the author cannot list all the various methods of treatment for each ailment, but he dogmatically describes the methods that he has proved most efficient in his own practice, and all practitioners will find this useful. A comprehensive appendix on chemotherapy contains the latest knowledge on the use of the sulphonamides and penicillin, whilst posological tables and much other practical data are also included, such as lists of weights and measures and a table showing the changes in the cerebro-spinal fluid which occur in different diseases.

Being of such a handy size, this book can readily be carried in a small case or motor-car pocket, and for all who need this type of work this particular book can be thoroughly recommended.

---

[1] "Children's Eye Nursing", by James Hamilton Doggart, M.A., M.D. (Cantab.), F.R.C.S. (England); 1948. London: Henry Kimpton. 7¼" × 4¾", pp. 160, with many illustrations, some of them coloured. Price: 8s. 6d.

[2] "The Essentials of Modern Surgery", edited by R. M. Handfield-Jones, M.C., M.S., F.R.C.S., and A. E. Porritt, C.B.E., M.A., M.Ch., F.R.C.S.; Third Edition; 1948. Edinburgh: E. and S. Livingstone, Limited. 9½" × 6", pp. 1276, with many illustrations. Price: 50s.

[1] "Vade Mecum of Medical Treatment", by W. Gordon Sears, M.D. (London), M.R.C.P. (London); Fifth Edition; 1947. London: Edward Arnold and Company. 7" × 4½", pp. 416. Price: 10s. 6d.

The Medical Journal of Australia

SATURDAY, JUNE 12, 1948.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given without abbreviation: initials of author, surname of author, full title of article, name of journal, volume, full date (month, day and year), number of the first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors who are not accustomed to preparing drawings or photographic prints for reproduction are invited to seek the advice of the Editor.

THE INVESTIGATION OF METABOLISM.

THERE is a tendency for each scientific instrument devised for diagnostic service, after an initial welcome and possibly some use by the general practitioner, to pass into the hands of the specialist. Few have the happy fate of Laennec's stethoscope which soon became a veritable emblem of the healer, announcing its presence by a slight bulge in the tall hat of the old-world physician and even today, though an affair of pliant rubber tubes, proclaiming on stage or street the man of medicine. A sound training in stethoscopic methods is still demanded from the medical student, even though the limitations of the instrument are fully recognized. Most general practitioners, especially those in the country, find the microscope indispensable, as also some simple form of hæmoglobinometer. When Helmholtz invented the ophthalmoscope this was hailed at first as a new and wonderful implement, for the eye is, in all truth, a microcosm and even today in the lay mind there is an element of mystery in a consultant's ability to detect a disease of the kidneys by peering into the organ of vision. But soon the use of the ophthalmoscope drifted into the hands of the specialist and though several medical schools have insisted that each student should be made familiar with the use of the apparatus and the interpretation of the observed changes in the fundus, few general practitioners of today would care to pit their skill and judgement against those of the ophthalmic surgeon. Then came the X rays and many a physician and surgeon at one time felt compelled to purchase an expensive outfit because he learned that his nearest colleague had done this. Today the interpretation of the X-ray photograph has been willingly handed over to the skilled radio-diagnostician. When Einthoven designed the string galvanometer—and curiously enough this ought to have preceded the three galvanometers employed by the physicist and physiologist, for it is a d'Arsonval galvanometer reduced to its simplest form—the busy practitioner was a little frightened of both the delicate technique which the instrument demanded and the difficulties of resolving the complicated graphs given by the several leads. Electrocardiography passed therefore very easily into specialists' hands. Very different was the fate of the Riva Rocci apparatus for estimating arterial blood pressure. Here was a simple device giving numerical information concerning a most important condition of the body about which the stethoscope yielded little or no guidance. In consequence the Riva Rocci apparatus, subjected of course to minor improvements in form and application, took its place beside the stethoscope as an inseparable companion of the family doctor.

What, we may ask, is going to be the outcome of the device of following the radioactive isotope, the "tagged atom", throughout the human body? Already the prophecy has been made that the general practitioner in the near future will carry with him a Geiger counter in the same manner as he carries his stethoscope. This new technique has yielded information of a remarkable character concerning absorption and distribution of certain necessary components of the body, not the least wonderful being the discovery of the rapidity of the flow of new material into, and of old material out of, the tissues of the body, even those assumed to be tolerably persistent in chemical composition. This constant flux of matter through all living tissue is no longer regarded as a making good of losses by wear and tear, but a dynamic process of essential import and close to the central mystery of life. Though it will be admitted that the introduction of radioactive isotopes for therapeutic purposes must be carried out warily with an eye to the threshold of danger there is little to fear from the tagged atom used diagnostically, for, after all, the chief metal in all tissues of the body, except bone, tooth and blood, is potassium, and the potassium selected by living things contains a radioactive isotope. Indeed, some biologists have declared that there is more radioactivity in organic potassium than in the potassium of the inanimate world. It may be safely predicted that tracing radioactive isotopes through the body will become a diagnostic procedure of importance, but whether the general practitioner will welcome and adopt the method or leave it to specialists remains to be seen.

There is, however, one department of biochemical research employing radioactive isotopes which requires a highly specialized knowledge and skill in organic chemistry and that is the elucidation of the metabolism of carbohydrates and fats and the nature of oxidizing and reducing processes. The late Professor Knoop, of Tübingen, was the first to think of tagging a carbon atom so that it could be detected in the products of metabolism.[1] This method, quite properly regarded as ingenious at the time though now put aside as clumsy, was to attach a benzene ring to the carbon atom in a fatty acid furthest from the carboxyl group and then to feed this to experimental animals. The benzene ring to which it is attached escapes oxidation and by this means Knoop discovered that when a long-chain fatty acid is oxidized, two carbon atoms split off at a time. This method of Knoop had some obvious limitations, for the tethered benzene ring often made the compound incapable of metabolism if not actually toxic. Then came the radioactive isotopes of carbon, namely C^{13} and C^{14}. As an example of the complexity of the issue let us take uric acid.[2] In experiments with birds, in which uric acid

[1] *"Beiträge zur chemischen Physiologie und Pathologie,* Volume VI, 1904, page 150.
[2] D. Wright Wilson: "The Use of C^{13} and C^{14} in Medical Research", *Journal of the Franklin Institute,* September, 1947.

is the chief nitrogenous excretory product, it was found by very skilled and difficult analyses that the nine carbon atoms of uric acid could have widely different origins. Thus when isotopic bicarbonate of sodium was fed it was number "6" carbon atom which alone showed radioactivity. Sodium acetate labelled in its carboxyl group caused isotopic carbon to enter the "2" and "8" positions. Lactates with the isotopic carbon in the α or β position gave tagged carbon in the "5" position, whereas if in the carboxyl then it was found in position "4". Carboxyl-tagged carbon in amino-acetic acid entered the "4" position, but if in the α situation it entered "5". The investigation of protein metabolism by the same technique is still in its early infancy, whilst pathological chemistry dealing with toxins, antitoxins, allergic agents, hæmolysins, agglutinogens, neoplasms of all sorts and even genes is an unknown territory awaiting the explorer. It is to be hoped that political and economic security and freedom from bureaucratic direction will allow this most important branch of biology and medicine to develop as it should, for little foresight is needed to realize that results of incalculable value will be obtained.

Current Comment.

RECURRENT PANCREATITIS.

CHRONIC recurrent pancreatitis as a diagnostic entity is rather vague, being represented in its least real form as a name in a list in a textbook on differential diagnosis, and emerging into reality only when the surgeon's fingers detect induration in the organ in question. A recent study of this condition by S. N. Maimon, J. B. Kirsner and W. L. Palmer based on twenty cases draws attention to features of importance in the understanding of the pathological basis and in the diagnosis.[1] They describe recurrent pancreatitis as an entity characterized by repeated episodes of pain in the upper part of the abdomen. The patients included twelve men and eight women, and were equally divided between the ages under and over fifty years. The duration of the symptoms was several years in most of the patients, and the interval between the attacks varied greatly, ranging from two days to six months. In addition a complaint of some constant digestive disturbance was common. The outstanding symptom was pain. This was sometimes severe, and sometimes indefinite; it could be localized by some of the patients, but not by others. The direction of radiation, if any, was not constant. Three patients did not complain particularly of pain, but in these cases the diagnosis was rather pathological than clinical, being founded on the discovery of evidence of calcification by radiological examination. Alcohol, which has been blamed by some writers, did not appear to be a significant cause in this series. Loss of weight occurred in over half the patients, and jaundice had occurred at some time in the past in eight out of the twenty. Clinical examination did not reveal anything of significance. Some tenderness was common on palpation, but it was seldom that any mass could be distinguished.

Laboratory investigation sometimes showed an increase in the serum amylase, up to as high as 1500 units in one instance, but there was no constancy in the results of this test. The authors thought that alteration in the serum amylase level was due rather to changes in activity of the pancreatic tissue than to destruction of cells. Estimation of the tolerance for glucose was more helpful, and the impression was gained that a raised curve in association with recurrent attacks of abdominal pain suggested the possibility of chronic pancreatitis. The same applied to the transient appearance of sugar in the urine. In a few of these patients, as might be expected, a diabetic state was discovered. Steatorrhœa occurred in 25%. Radiological examination returned no constant findings; relative duodenal constriction was found in two patients, the pancreatitis being a part of a wider process.

It is of interest to know that surgical operations had been performed on half these patients in unsuccessful efforts to relieve them of their pain. Over half of the operations were on the biliary tract. Further surgical exploration was carried out on sixteen out of the twenty patients. Seven of them were relieved by procedures, which varied with the indications, but the numbers were too small to allow any specific deductions to be drawn. Though a raised serum amylase level was not found constantly, as just pointed out, these authors found that there was some indication that decided pancreatic induration found at operation was associated with a high level of amylase, especially during the acute episodes. Removal of the gall-bladder did not *per se* relieve the symptoms, and in a few relief seemed to follow one of the anastomotic procedures, as has been claimed also by other workers in this field.

Chronic recurrent pancreatitis is doubtless an entity, and appears to be a condition reached by various processes at work in the upper abdominal digestive organs. Naturally there can hardly be a clearly outlined picture that will fit all cases, nor can any routine treatment be expected to succeed. The authors do not attempt to explain the mechanism of the pain, nor to explain its recurrent nature. Indeed the cause of recurrent pain in gall-bladder disease is far from clear even when stones are present in the gall-bladder, and the cause of the pain in the "failed cholecystectomy" is also often obscure, even though we may dignify it by calling it "dyskinesia" of the biliary passages.

[1] *Archives of Internal Medicine*, January, 1948.

THE PREVENTION OF TETANUS.

THE value of immunization against tetanus by the use of a tetanus toxoid is now generally accepted, but it is important to have proof. A number of articles have appeared in the literature, and these have dealt not only with the use of tetanus toxoid as a primary immunizing agent, but also with its value as an adjunct to the surgical treatment of wounds. W. W. Hall has collected facts concerning the results of the use of toxoid in the United States Navy.[1] He quotes Roddis, who gives the average rate in the German Army in the 1914-1918 war as 380 per 100,000 wounded, with 300 deaths, which works out to a total of 12,000 deaths from tetanus alone. In 1940 the desirability of adopting universal and compulsory immunization in the American Navy and Army was accepted without hesitation as being necessary if the country became involved in war, but the question of abandoning antitoxin prophylaxis was not so sure. Whether the plain fluid toxoid or an alum-precipitated toxoid should be adopted was debated also by an unofficial group representing all services and the National Research Council. Work was carried out on volunteers which showed that satisfactory antitoxin was produced by both types of toxoid, but the alum preparation proved to be the more potent antigen. Two injections of alum toxoid at an interval of a month were favoured by the Navy, while the Army adopted the plain fluid toxoid, possibly on account of the lesser liability to reactions.

When war broke out between America and Japan there was at first some tendency among older surgeons to lack confidence in the protection afforded by toxoid alone, and antitoxin was still given to the wounded by some, but this did not last long, and the administration of a booster injection to all men after a year or at other time should it seem necessary and to all wounded men was soon trusted to deal with tetanus infection. The figures for

[1] *Annals of Internal Medicine*, February, 1948.

incidence of tetanus in the two great wars of the last generation show that in 1917-1918 out of 9670 wounded two men contracted tetanus and both died, whereas in 1942-1945 out of 89,988 wounded four cases occurred with two deaths. No marines were infected, in spite of the risks they ran in a number of the island combats.

Reactions experienced with alum toxoid were few and minor in nature. An interesting comparison of the above results with the experiences of the Japanese is given. Among one group of 284 wounded Japanese from a combat area the incidence of tetanus was about 5% and the death rate was over 70% among these. At the same time of 384 American wounded from the same area, who had been given the routine injections, with an additional injection after being wounded, none were affected by tetanus. There are other evidences that unimmunized troops showed a high incidence of tetanus and a high death rate.

Boyd has already published some figures for British troops which showed a higher incidence after immunization than might have been expected, and these indicate better results in treatment of the wounded by tetanus antitoxin. The argument for this was that its passive action in conferring immunity did not involve the unknown factor of the wounded man's ability to elaborate antitoxin himself from an antigen. However, this does not affect the value of the report at present under review. The results of the American Army are also quoted, which were excellent, there being only five deaths from tetanus during the war, two being those of men incompletely immunized, These results are excellent, especially when it is mentioned that the cases encountered in the Navy did not arise from combat wounds but from accidental injury. The American experience therefore favours complete dependence on active immunization, which, it is claimed, can virtually eliminate the disease in an armed force.

THE TREATMENT OF LEPROSY.

THE treatment of leprosy is a most contentious subject, as this disease seems to present almost unique difficulties in the way of evaluating a particular form of therapy. Chaulmoogra oil and its derivatives have been the traditional therapeutic agents for a very long time and, specially since the introduction of the injectible derivatives some thirty years ago, brilliant results have been claimed from its use; yet at some important leprosy treatment centres it has been discarded as inadequate and even harmful. Other therapeutic agents have been introduced from time to time as offering much promise (as, for example, various dye substances which were discussed in these columns on April 21, 1934), only to be abandoned and forgotten. However, the latest claimants, the sulphone drugs, seem to be winning a good deal of support. G. H. Faget and Paul T. Erickson have reported[1] that since 1941 sulphone drugs (first "Promin" and later "Diasone" and "Promizole") have been used at the National Leprosarium in the United States "with exceedingly good results". The three drugs mentioned are derived from diaminodiphenylsulphone which is considered to be the active principle of each. They have also been used in the treatment of tuberculosis with rather disappointing results, though recent reports suggest that they may have a real place beside streptomycin in the treatment of tuberculous meningitis. "Promin" has been given by the intravenous route because of toxic effects produced when it was given orally. "Diasone" and "Promizole" are given by mouth—a most desirable feature, especially from the patient's point of view. In the series reported by Faget and Erickson sulphone therapy of 371 patients has been initiated, all patients having lepromatous leprosy and many being in an advanced stage of the disease. The drugs, it is stated, are very slow in action; "definite objective improvement, as a rule, seldom becomes manifested before six months of treatment". But improvement has occurred and thereafter was progressive with few, if any, relapses. The percentage of patients improved has been in direct proportion to the duration and the intensity of treatment, results from each of the three drugs apparently being similar; after three years almost 100% of patients showed some improvement. Even far advanced lepromatous disease was checked and decreased under treatment. Laboratory investigations have indicated that the action of the sulphone drugs in leprosy is bacteriostatic.

Although they have obtained most encouraging and even impressive objective clinical results, Faget and Erickson refuse to be precipitate in their judgement and insist that the ultimate value of sulphone therapy in leprosy is not definitely established; only after five or ten years or even longer will it be possible to be reasonably sure that relapses will not occur. It is as well also not to overlook disadvantages. The action of the sulphones is extremely slow and research for a more quickly acting drug is worth pursuing. As well, toxic effects are not negligible; a speaker in the discussion which followed the presentation of Faget and Erickson's paper reported a death from agranulocytic angina attributed to "Diasone", and Erickson admitted that a careful watch needed to be kept for such effects, though his experience was that toxic manifestations were mild. At the same time he referred to the notable subjective improvement that was a usual feature of the treatment. This is interesting, especially when taken in conjunction with the statement of another speaker that older experienced patients have discarded chaulmoogra oil for the sulphones, taking the latter with enthusiasm.

A brief reference is made in this report to streptomycin, but, while further investigation of its value is recommended, the opinion is expressed that its toxic effects seem to be too severe in comparison with results obtained in the treatment of leprosy. For comparable results the sulphones have so far been found to be less toxic and must be considered the optimal treatment of leprosy at present.

It is interesting to turn from this American discussion to the latest pronouncement by Sir Leonard Rogers.[1] This notable authority, while welcoming the sulphones, does not show the slightest inclination to discard chaulmoogra oil derivatives, of which he has had very great experience. In tracing the development of chaulmoograte therapy, Rogers describes the effects, observed microscopically, on tissue and organisms which accompanied clinical response to the treatment. He then refers to the corresponding effects of sulphones as described by Faget and also by Muir, and states that, if these conclusions of experienced leprologists are correct, the actions of the two classes of drugs in leprosy appear to be largely complementary. Thus, the chaulmoograte seem to act by destroying vast numbers of lepra bacilli in nodules and other lesions, especially when "pushed" or given by the intravenous route, but with some risk that surviving bacilli in the softened reacting lesions may be disseminated through the blood-stream to produce new lesions. On the contrary, sulphones exert a very slow action in destroying lepra bacilli in the affected tissues, but with the advantage that they lessen the frequency and severity of reactions by destroying any living bacilli which may reach the blood-stream. They should thus counteract the risk of harmful reactions resulting from "pushing" the more rapidly acting full doses of chaulmoograte. Rogers considers therefore that the administration of both classes of remedies, especially for advanced lepromatous conditions, is indicated, but advises beginning with several weeks' treatment with a sulphone to ensure its presence in the blood before the action of the chaulmoograte may have led to the dissemination of living lepra bacilli. Whether this suggestion will find general favour, or whether Faget and Erickson will be justified in their prophecy that the sulphone drugs will replace chaulmoogra oil until a better treatment is evolved, it would be unwise to speculate. We are at least entitled to feel hopeful of an advance and may leave conclusions to the future.

[1] *The Journal of the American Medical Association*, February 14, 1948.

[1] *The Lancet*, April 3, 1948.

Abstracts from Medical Literature.

GYNÆCOLOGY.

The Treatment of Carcinoma of the Vulva.

J. L. McKELVEY (*American Journal of Obstetrics and Gynecology*, October, 1947) advocates radical vulvectomy as the most efficient method of treatment for carcinoma of the vulva. Other methods of treatment produced an absolute cure rate of 13·9% and a relative cure rate of 15·6%. In the author's series of 38 patients treated by radical vulvectomy, four are alive and well more than five years after operation, and eighteen are alive and free from tumour after from two to fifty-nine months. The operation is described in detail. A wide excision of the vulval skin and subcutaneous tissue is made, including as much of the vagina as possible. The author states that in his experience early carcinoma of the vulva, other than that of the clitoris, is curable in a very large proportion of cases if radical procedures are undertaken at once. Carcinoma of the vulva, particularly that of the *labia majora*, is a generalized disease and the multiple nodules or recurrences are more often new areas of tumour than metastases or residual tumour from the main mass. Lymphatic metastases tend to remain for long periods of time in the inguinal and femoral areas without spreading, and the presence or absence of palpable glands is no useful criterion to the presence or absence of tumour in this area. A large proportion of wounds break down from skin necrosis despite precautions. The less undermined skin left, the better the healing will be.

Hydatid Mole and Chorionepithelioma.

ALBERT W. HOLMAN AND ELIZABETH H. SCHIRMER (*The Western Journal of Surgery, Obstetrics and Gynecology*, October, 1947) record the results of the aggregate of three five-year studies of hydatid mole and chorionepithelioma based on information gathered by *questionnaire* from three Pacific Coast States. The analysis is made on information concerning 426 patients with hydatid mole and 107 patients with chorionepithelioma. Of the examples of hydatid mole, 60% occurred in multiparous women and the condition was found to be not as common in patients over forty years of age as is recorded by other workers. Four patients in the series had moles on more than one occasion, one patient having had three moles. Hydatid degeneration usually occurs during the fifth week of pregnancy, at the time when fœtal circulation should begin. A living child is very rarely born in the presence of considerable molar degeneration. Bleeding is the most constant symptom, but other symptoms, such as the passage of vesicles, nausea and vomiting, painful uterine contractions, amenorrhœa and toxæmia may be present. Only 2% of patients had an associated toxæmia of pregnancy, a lower incidence than has been reported by other workers. The authors consider that less emphasis should be placed on excessive enlargement of the uterus as one of the outstanding signs of hydatid mole. Some years ago a positive result to a Friedman test, in which spinal fluid had been used, was thought to be diagnostic of hydatid mole or chorionepithelioma; it is now known that this test is not absolutely diagnostic, but only very presumptive. Curettage is preferable to hysterotomy in the treatment of hydatid mole, and hysterectomy has no place in the treatment of this condition. Chorionepithelioma followed hydatid mole in 16% of patients and more than half of the patients who had chorionepithelioma were *multiparæ*. Bleeding is the only common symptom of chorionepithelioma, and the other symptoms are those which would be expected from enlargement of the uterine tumour or from metastases. Most patients with chorionepithelioma had hysterectomy of some type; the type of operation had no apparent influence on the mortality rate. The authors do not approve of routine bilateral oophorectomy in patients with chorionepithelioma treated surgically. Pulmonary metastases are the greatest single cause of death in chorionepithelioma.

The Results of Carcinoma of the Cervix Uteri Treated by Radical Vaginal Operation.

SUBODH MITRA (*American Journal of Obstetrics and Gynecology*, February, 1948) describes his technique of radical vaginal hysterectomy for patients with carcinoma of the *cervix uteri* and gives the five-year survival results in 151 cases. The author considers that an analysis of world statistics shows that the end results of treatment of cervical cancer, whether by operation or radiation, are, for all practical purposes, the same in the hands of experts. He has used a radical vaginal operation since 1932, supplemented by post-operative radiation, and has had better results than with treatment by radiation therapy alone. He claims that the operative mortality is much less when the radical vaginal operation is used than with the classical abdominal Wertheim operation (3·8% as against 14%). Other complications, such as fistulæ, are less frequent, and the end results are practically the same. The obvious handicap of vaginal operation is that cancer-affected lymph glands cannot be removed, but the author considers that when involved iliac glands are removed the aortic group of glands are already carcinomatous and cannot be removed surgically. The important lymphatic spread in carcinoma of the *cervix uteri* is along the transverse cervical ligaments of Mackenrodt and this tissue can be most widely excised by vaginal operation. The technique of the operation is described and emphasis is placed on the Schuchardt incision for free access to the parts, the removal of a large vaginal cuff, and the radical removal of the parametrial connective tissue. The relative five-year cure rate among 151 patients treated in this way was 37·6%, the operative mortality rate was 3·8%, the bladder was injured in 3·8%, and *Bacillus coli* infection was the outstanding cause of post-operative morbidity.

Results of Radiation Therapy in Carcinoma of the Cervix.

HENRY S. KAPLAN, HUGH M. WILSON AND ARTHUR H. MORSE (*Surgery, Gynecology and Obstetrics*, March, 1948) report the five-year results of treatment of 88 patients with carcinoma of the cervix by combined Röntgen radiation and the surface application of radium. All patients were submitted to biopsy and were grouped according to the League of Nations classification. Treatment consisted of preliminary deep X radiation, a dose of 1500*r* to 18,000*r* being administered to each of four to six portals over a period of three to four weeks. Radium insertion is performed four to six weeks after completion of the Röntgen therapy and is done essentially according to the "Paris technique", a total dosage of 6000 milligramme-hours being delivered. The net five-year survival rate for the series of 88 patients was 38%. An analysis of results according to clinical grouping of the cases was significant. There was a 69% five-year survival rate for stage I cancers, 47% for stage II, 4% for stage III, and none for stage IV cases. A review of these results by the authors shows that their results with stage I and stage II cancers agree generally with those obtained by other workers, but results in stage III and IV growths fall far below those quoted in the literature. Complications following treatment were small and appeared to be due to the disease process rather than the result of treatment. Technical difficulties and extreme debility and constitutional infirmity often caused incomplete and inadequate dosage of radium. The incidence of distant metastases among all patients who died was higher than generally recorded (23%). The authors discuss technical modifications which might yield better results, and conclude that the interval between Röntgen and radium therapy should be shortened from six weeks to two weeks, that radium dosage should be increased in advanced cases to 7000 or 8000 milligramme-hours, that the "Manchester technique" of radium application should be adopted, and that extraperitoneal resection of the iliac lymph glands should be performed after irradiation in stage I, II and III growths.

The Treatment of Cervix Carcinoma with Radium and X-Ray Therapy.

HERBERT E. SCHMITZ (*American Journal of Obstetrics and Gynecology*, February, 1948) reports the results of treatment of 166 patients suffering from primary carcinoma of the *cervix uteri* with radium and deep X-ray therapy. According to the clinical grouping of patients, 70% were in the later or unfavourable stages. A histological grading of the tumours on Broder's classification showed 62% were in grades II and III. Adenocarcinoma of the cervix comprised 2·4% of all cases. Radium therapy is given in conjunction with the X-ray treatment unless the condition of the cervix is such that radium insertion is technically difficult. The five-year end result of all cases was 43·37% of survivals. The five-year survival rate among group I cases was 90%, among group II cases 72%, among group III cases 42%, and among group IV cases 10%. These results show an improvement of 15% in survivals on figures quoted by the same author on a study of 275 patients in 1934 treated with a similar dose of radium but lower voltage X radiation. The technique of radiation by radium and deep X rays is described and varies considerably from the generally accepted procedures as regards dosage and method of application. The author considers this technique has helped in avoiding bowel, urethral and bladder

injury, and that radium and X rays in safe doses destroy cancer within the region of the cervix in 80% to 90% of cases. If the growth has extended into the paracervical areas the cure rate drops to 52% to 56%. The survival rates obtained in the group I and II cases of this study are compared with reported series in which surgery was used, and the author considers that the evidence presented is in favour of continued radiological treatment of cervical cancer.

OBSTETRICS.

The Placental Stage and Post-Partum Hæmorrhage.

HÆMORRHAGE caused 30% of the maternal deaths in the United States of America in 1944 and 1945, and these deaths were either preventible or had preventible factors. The incidence of post-partum hæmorrhage in the best maternity hospitals is between 2% and 3%, and W. J. Dieckmann, Lester D. Odell, Victor M. Williger, Arthur G. Seski and Russell Pottinger (*American Journal of Obstetrics and Gynecology*, September, 1947) state that the mortality from post-partum hæmorrhage can be reduced almost to zero if the late second and early third stages of labour are properly conducted. The authors' studies indicate that the placenta normally begins to separate as the baby is born and it can be expressed usually within one to three minutes after delivery. With the mother in the upright or squatting position gravity would cause early placental delivery; with the mother in the supine position and anæsthetized external force must be used. The intravenous administration of "Ergotrate" in the late second stage reduced the incidence of post-partum hæmorrhage, but atonic bleeding still occurred in a few cases. The intravenous injection of "Ergotrate", solution of posterior pituitary lobe extract or saline solution, in the late second stage, showed that in the majority of cases the oxytocic had no effect in the separation or delivery of the placenta. Slow delivery of the fœtus seemed to be the factor which favoured separation of the placenta. The average time (in *primiparæ*) taken for delivery of the fœtus was three and a quarter minutes, and in 90% to 92% of cases the placenta was delivered within three minutes, with or without oxytocic drugs. With no oxytocic drug, however, the blood loss is increased. The placenta is expressed as soon as the uterus is persistently globular (Calkin's sign). If the delay is too long the muscular portion of the uterus may contract about a portion of the placenta and make expression difficult; this necessitates a manual removal. If there is hæmorrhage the placenta is expressed or removed manually at once. If there is no bleeding the placenta is removed manually within one hour at a maximum and usually within fifteen minutes after delivery. Estimation of blood loss showed that it was greatest with rapid delivery of the fœtus without an oxytocic and minimal when the delivery was prolonged and oxytocics were used. Solution of posterior pituitary lobe extract, one unit given intravenously, seemed to be slightly better than "Ergotrate". The authors urge that uterine hæmorrhage should be treated by immediate removal of the placenta, manually if necessary, or after the third stage by manual palpation of the uterine cavity and visual inspection of the vagina and cervix. Oxytocics should be injected intravenously and repeated once. If bleeding continues the uterus must be packed. Urgent blood transfusion is a necessity.

Induction of Labour.

IN an analysis of 8503 deliveries at the Chicago Lying-In Hospital, W. J. Dieckmann and Robert B. McCready (*American Journal of Obstetrics and Gynecology*, September, 1947) found 618 attempted inductions of labour, an incidence of 7·3%; in 276 patients, or 3·2%, induction of labour was effected and 342 underwent Cæsarean section. Termination of pregnancy by induction of labour after thirty-two weeks has less indication today than twenty years ago, although there are still an increased maternal and fœtal morbidity and mortality. The primary indication must always be that the patient will be better off with the uterus empty; or, if the infant is alive and in good condition, that its chances of survival are increased by early delivery. The authors' indications for induction are selected cases of *placenta prævia*, *abruptio placentæ*, eclampsia and non-convulsive toxæmia of pregnancy. In the presence of *placenta prævia*, if the placenta is not central and there is some dilatation of the cervix, the membranes are ruptured. If the bleeding cannot be controlled thus or by traction on the head or foot, Cæsarean section is performed. In cases of accidental hæmorrhage the membranes are ruptured; Cæsarean section is performed only when the Couvelaire type of uterus or complete placental separation is suspected. For toxæmic patients the best treatment is termination of the pregnancy; this depends, however, on the condition of the cervix and on the severity of the toxæmia. If the latter permits delay the cervix will change and permit relatively safe induction of labour. The authors regard induction for post-maturity, contracted pelvis and the convenience of patient and doctor as contraindicated. The cervix "ripe" for induction in a *primipara* is regarded as one in which there is complete effacement and the cervical margins are 0·5 to 1·0 centimetre thick and soft. The dilatation varies from nil to three centimetres. In *multiparæ* the canal may or may not be effaced, but in either case there are two or more centimetres' dilatation and the cervix is soft. Castor oil, castor oil and quinine, and œstrogens or stilbœstrol have been useless in the authors' hands. Their technique is described in detail.

Late Dystocia Treated by the Norton Extraperitoneal Cæsarean Section.

W. LEVINE AND S. WEINER (*American Journal of Obstetrics and Gynecology*, December, 1947) discuss the problem of the safe delivery in dystocia recognized late in labour or after failure of attempted vaginal delivery. Transperitoneal Cæsarean section at this stage is hazardous owing to the subsequent high maternal mortality from peritonitis. Traumatic vaginal delivery with or without fœtal destructive operations, even in *multiparæ*, has proved disastrous to the fœtus and has caused a high maternal mortality. Cæsarean hysterectomy also has a high mortality. The authors prefer extraperitoneal Cæsarean section, done according to the technique of Norton. This is a paravesical approach with blunt dissection of the fascial investments of the bladder and blunt partial separation of the peritoneal folds from the uterus and bladder, with the elimination of frequent peritoneal injuries. The operation was performed in 35 cases, 33 of which were complicated by prolonged labour, many hours of ruptured membranes, frequent vaginal examinations or intrapartum morbidity. These patients were potentially or actually infected. The other three were cases of elective Cæsarean section in which the technique was practised. In fifteen cases fœto-pelvic disproportion was present, in seven there was cervical dystocia; there were five cases of uterine inertia, four of malpresentation and malposition, and there was one case of failed forceps. The bladder was injured twice, or in 5·7% of cases, and was immediately repaired with no subsequent sequelæ. The peritoneal cavity was opened three times in the authors' early experience with the operation. There were three stillbirths in the series—one was a known fœtal death as a result of failed forceps, and in the other two well-developed signs of fœtal distress had been present preoperatively. Post-operative morbidity occurred in six patients—a rate of 17·1%. Four patients had post-operative complications—two had excessive wound drainage, one had marked abdominal distension, and the one maternal death was from massive pulmonary embolism, which occurred eight hours after operation.

Fœtal and Neonatal Mortality.

J. P. GREENHILL (*The Journal of Obstetrics and Gynæcology of the British Empire*, October, 1947) reviews the causes and prevention of fœtal and neonatal deaths. Of such deaths 10% are due to monstrosities and the author suggests that a slight reduction in this figure may be made if women who have once given birth to a monster do not have any more pregnancies, if women could be encouraged to have children prior to the age of thirty-five years and preferably at less than thirty years of age, and if abortion is considered for women who contract German measles during the first three months of pregnancy. A saving of fœtal lives can be accomplished in several ways. The first is by proper ante-partum care so that the woman will be able to pass through pregnancy and labour without detriment to herself and baby. The second is by prevention and treatment of prematurity. Delivery should preferably be in a hospital where warmth and oxygen are readily available. The minimum of analgesia and anæsthesia should be used. The third way is by the prevention of birth injuries. The majority result from lack of skill, poor judgement, haste, the injudicious use of analgesia and anæsthesia, and deliberate carelessness of and disregard for human life. Asphyxia must be promptly treated by proper positioning, warmth, the clearing of the respiratory passages and the supply of air or oxygen to the lungs. The use of a timely episiotomy and local anæsthesia may prevent cerebral hæmorrhage in some cases. The fourth method is by the prevention of acute infections in the newborn by strict asepsis and antisepsis during and after delivery. The fifth is by the prevention of eclampsia by adequate prenatal care. The sixth is by detection and treatment of fœtal erythroblastosis.

British Medical Association News.

SCIENTIFIC.

A MEETING of the Victorian Branch of the British Medical Association was held at the Children's Hospital, Carlton, Melbourne, on November 19, 1947. The meeting took the form of a series of demonstrations by members of the honorary medical staff of the hospital and was combined with the monthly meeting of the Melbourne Pædiatric Society. Part of this report appeared in the issues of May 22, May 29 and June 5, 1948.

The Preparation of Streptomycin.

DR. J. F. FUNDER, of the Commonwealth Serum Laboratories, presented a demonstration on the preparation of streptomycin. Exhibits indicated the process of preparation of streptomycin by surface culture of *Streptomyces griseus*, the various stages of its extraction and purification, and the methods used for assay and testing of the final product to ensure suitability for clinical use. Methods were demonstrated for determining the sensitivity to streptomycin of a variety of bacterial strains. In view of the necessity for rigid standardization of conditions of sensitivity testing, in all cases determination of the sensitivity to streptomycin of an organism was made relative to that of a standard strain of *Staphylococcus aureus*. Methods exhibited included gutter-plate, cylinder-plate and paper-strip techniques, and a serial dilution method developed at the Commonwealth Serum Laboratories.

Œsophageal Stenosis.

DR. H. J. SINN showed a boy, aged two years and five months, who had had a history of failure to thrive, vomiting at intervals and difficulty with the swallowing of solid food. On examination the child was grossly underweight and pale; his weight was twenty-three pounds. Various diagnoses had been suggested such as that the condition was due to feeding mismanagement or to faults of dentition and lack of teeth to chew with or that the child presented a dietetic problem. X-ray examination with the swallowing of a barium bolus revealed no abnormality, but when a bolus of thick barium was used œsophageal stenosis was discovered. Treatment with iron and a suitable diet had been instituted; surgery might be undertaken at a later date. Dr. Sinn remarked that the case demonstrated the diagnostic difficulties which existed in such cases; the use of thick barium or a barium biscuit was helpful.

Congenital Bilateral Hydronephrosis and Hydroureter with Chronic Pyobacilluria.

Dr. Sinn then presented a girl, aged three years and three months, whom he had first seen when she was aged one year and nine months. She had a history of recurrent attacks of "pyelitis" characterized by fever, abdominal pains, anorexia, frequency of micturition and pallor for three months. On each occasion the acute condition would subside on treatment with full doses of sulphadiazine and alkali, but would recur when those were suspended, a fact which suggested some underlying renal pathological condition. The urine when examined on May 29, 1946, contained pus cells and organisms and from it a culture of *Bacillus coli communis* was grown. X-ray examination of the renal tract on June 3, 1946, revealed the outline of a large kidney on the left side. An excretion pyelogram on June 14, 1946, provided evidence of bilateral hydronephrosis. A left retrograde pyelogram on June 26, 1946, indicated the presence of hydronephrosis and hydroureter and also the extravasation of dye into the perirenal tissues. Examination of the blood on June 19, 1946, revealed hypochromic microcytic anæmia; the hæmoglobin value was 45%; the red blood cells numbered 4,690,000 per cubic millimetre and showed the appearance of hypochromia and anisocytosis; the white cells numbered 29,200 per cubic millimetre, the differential count being normal. A catheter specimen of urine on July 5, 1946, contained pus cells and organisms, and from it a culture of *Bacillus proteus* was grown. Treatment was in the form of iron to combat the anæmia and prophylactic doses of sulphonamide, half a tablet of sulphadiazine being given three times a day from June, 1946. By October 18, 1946, the hæmoglobin value had risen to 80%, the white cells numbering 20,800 per cubic millimetre. On May 2, 1947, the hæmoglobin value was 74% and the white cells numbered 18,500 per cubic millimetre.

Dr. Sinn said that the child had been free from attacks of "pyelitis" since the inception of the sulphonamide therapy which was nearly eighteen months previously. The urine still contained pus cells and organisms, but the child enjoyed good health. She was, however, persistently wet, and on examination it was possible to see urine trickling away from the urethra. The bladder was often distended, sometimes to the umbilicus. The question was whether there was retention with overflow or an aberrant ureter opening into the urethra. There was marked excoriation of the vulval skin from constant moisture; that was controlled by therapy directed at the urinary infection and antipruritic ointment. Dr. Sinn remarked that the case demonstrated: (i) the importance of searching for the underlying basis for recurrent or persistent pyobacilluria; (ii) the use of prophylactic sulphonamide in small doses to control conditions not amenable to surgery; (iii) the problem of the constant "urinary dribbler".

Banti's Syndrome Treated with Splenectomy.

DR. MICHAEL PERL presented a female patient, aged four years and six months, who had been admitted to hospital at the age of two and a half years (November 26, 1945) with four days' history of melena. She was readmitted seven months later with further melena. On both occasions hæmorrhage was gross and her condition on admission was poor; she rallied with transfusions and slowly improved. Complete investigation failed to reveal any definite abnormality, and in view of the melena, anæmia and splenomegaly her condition was regarded as splenic anæmia or Banti's syndrome of which the ætiology was unknown. When the child was shown at a clinical meeting the consensus of opinion was that splenectomy was of doubtful value because of the associated hepatic cirrhosis. A liver puncture was performed and yielded doubtful evidence of cirrhosis. A liver biopsy was performed during laparotomy on September 27, 1947, by Dr. Russell Howard. The liver appeared normal at laparotomy. In the liver biopsy section the only pathological change discernible was that of cloudy swelling of irregular incidence affecting the parenchymal cells. There was no evidence of existing or potential cirrhosis. On October 31, 1946, X-ray examination following a barium meal revealed no evidence of any organic lesion in the alimentary tract. The hæmoglobin value was 90% on November 6, 1946. Splenectomy was performed on November 13, 1946. Examination of a section of the spleen showed diffuse and pronounced cirrhosis with capsule and trabeculæ greatly thickened, prominent reticulum and fibroblastic tissue throughout the pulp and hyperplasia (probably compensatory) of germ centres compatible with Banti's disease. On November 20, 1946, the child's condition was excellent; the hæmoglobin value was 89%, the red blood cells numbered 4,590,000 per cubic millimetre, and numerous platelets were present. She was discharged to her home. She was readmitted with melena on two further occasions at intervals of six and nine months. Liver function tests performed by Dr. Ian Wood on June 12, 1947, yielded essentially normal results. No evidence of liver damage was found. Dr. Perl said that the child was active and energetic, but had occasional attacks of melena and some abdominal pain. The making of a porto-caval anastomosis, which might eventually be necessary, had been decided against for the present owing to inadequate knowledge of results, mortality and morbidity. It was considered that liver given intravenously, as well as a large oral intake of liver, might help to improve the child's condition.

Hæmolytic Anæmia Treated by Splenectomy.

Dr. Perl then presented a female patient, aged ten years, who had been admitted to hospital on November 12, 1946, with a history of symptoms for three months: anorexia, loss of weight, vomiting and listlessness. The spleen was just palpable, the conjunctivæ were yellow and there was a slight lemon appearance of the skin. The condition was considered to be anæmia with acholuric jaundice. The red cell fragility was normal; the hæmoglobin value was 55%; the blood was Rh-negative and of O (IV) group; the blood picture was that of macrocytic anæmia. The general picture simulated pernicious anæmia in the early stage. A sternal puncture on December 5, 1946, produced evidence of active hyperplasia of red cells and equally definite hypoplasia affecting the white cells, especially the granulocytes. Examination of a blood film showed active erythrogenesis in all stages and granulocytopenia. The hæmoglobin value was 49%; the red blood cells numbered 1,930,000 per cubic millimetre; the white cells numbered 2300 per cubic millimetre; the platelets were reduced in number. One millilitre of "Campolon" was given daily and the condition was treated as one of macrocytic hæmolytic anæmia. The child did not respond to parenteral administration of crude liver extract. She was given a blood transfusion and sent home

on January 4, 1947. Other tests at that time showed: no free hydrochloric acid in any specimen of fasting gastric content; an icteric index of 7·5 units; an indirect Van den Bergh reaction. The urine contained occasional leucocytes only. The proportion of reticulocytes in the blood was 6·5%; this gradually rose after transfusion. The child remained fairly well for two weeks after discharge from hospital when symptoms recurred, especially increasing pallor and tiredness. She became febrile (temperature 103° F.), but no cause for pyrexia was found. It was probably a hæmolytic crisis. She was given repeated blood transfusions and gradually improved. Destruction of the first pint of blood was complete in about ten days and the leucocyte count was grossly lowered (1800 per cubic millimetre). Improvement was maintained for a longer interval after the second transfusion. On March 26, 1947, the hæmoglobin value was 75%, the red cells numbered 2,160,000 per cubic millimetre and the white cells 1800 per cubic millimetre. The reticulocytes were 0·5% of the red cells. The child had been readmitted on two occasions since for transfusion, and as she appeared to be hæmolysing blood much faster than previously, splenectomy was considered. Splenectomy was performed on May 7, 1947. On May 8, 1947, the hæmoglobin value was 74%, the red cells numbered 3,530,000 per cubic millimetre and the white cells 14,000 per cubic millimetre. Four months later the hæmoglobin value was 63% and the red cells numbered 2,750,000 per cubic millimetre. She was being given ferrous iron and dilute hydrochloric acid. Pallor was increasing. After a transfusion the hæmoglobin value was 84%. Her weight was five stone five pounds. On October 6, 1947, the hæmoglobin value was 73% and the red blood cell count was 3,200,000 per cubic millimetre. Later the hæmoglobin value fell to 46% and a transfusion was given. Dr. Perl said that the intervals between transfusions had increased and the patient was maintaining a reasonable general condition.

Correspondence.

A BASIC ROUTINE FOR POST-OPERATIVE TREATMENT AFTER LAPAROTOMY.

SIR: It would appear that Mr. Kinsella is in agreement with most of the basic routine and objects only to the method of giving fluid in the immediate post-operative period. In his last letter (THE MEDICAL JOURNAL OF AUSTRALIA, May 8, 1948) he described the Murphy drip method of instilling tap water, drop by drop, into the rectum (where it is probably absorbed as fast as it arrives) as an "injection likely to disturb the peritoneal region which is usually most inflamed". This, I think, is hardly accurate. Again, I said that, should there be discomfort, sufficient morphine given regularly dulls it to the point of extinction, and this was rewritten as "morphine is sometimes needed to make the method tolerable". This may be Mr. Kinsella's opinion, but it is not a correct paraphrase of what was written. The regular administration of morphine was originally described by me as an essential part of the routine.

Mr. Kinsella has said that "controlled sipping" of water will not cause air swallowing, vomiting or paralytic ileus. I would say that whether it will or not depends, firstly, on how much and how rapidly it is sipped, and, secondly, on the extent and degree of the usual post-laparotomy paralysis of the small bowel. "After any laparotomy a temporary physiological ileus is inevitable"—these words are taken from an article by Rodney Smith (*Annals of the Royal College of Surgeons, England*, Volume II, page 47).

If to a patient, who has only a mild degree of post-paralysis, a sufficient amount of fluid is given orally to meet his daily requirements (2500 to 3500 cubic centimetres), it would probably cause discomfort and consequent air swallowing, and if persisted in, vomiting *et cetera*. This quantity can be safely and simply given by a rectal drip. Mr. Kinsella's "controlled sipping", I should imagine, would require much more supervision than a rectal drip, as it would be a very unusual patient who, when thirsty, would restrict himself to sips. No one, I presume, would give oral fluids to a patient whom he knew to be suffering from paralysis of the small intestine. Then, why give it if there is any uncertainty on this point? If there were no other way available, Mr. Kinsella's method might be admissible, but the rectal drip is simple and safe and an effective alternative. I have never used the irritants mentioned by Mr. Kinsella and I have attributed the absence of gas pains to the fact that the small bowel is not asked to do anything until it is ready to do so.

In conclusion, I know that the picture Dr. Kennedy has drawn illustrates a state of affairs that is not confined to one Sydney hospital and is one that causes a great amount of unnecessary and easily avoidable suffering. I had thought that, by calling attention to a method that has proved itself successful in my hands, somebody else might be tempted to try it and, finding that it works, pass it on.

Yours, etc.,

45, Spring Street, Melbourne,
May 14, 1948.

LEO DOYLE.

RE 100% FAILURE IN PART I D.D.R.

SIR: Surely it is time members exerted themselves to prevent a recurrence of this purge! The fact that no candidate has passed this examination since 1946 is undoubtedly not ascribable to any lack of application on the part of the doctors themselves. No senior practising radiologist would have passed these tests. The fault must therefore lie with the university's bad teaching and/or bad examining.

The remedy seems to lie in the formation of an interstate body consisting of representatives of the universities concerned and the various specialties; then we should not hear petty little remarks to the effect that the Melbourne diploma is higher than the Sydney one *et cetera*. Such a body could be responsible for the syllabus, setting of papers and examining of candidates in the different States—all papers set to be approved by practising specialists.

So members who have devoted valuable spare time (and cash) to the study for post-graduate diplomas would be spared victimization by examining cranks who imagine their subject to be the begin-all and end-all of medicine. And incidentally no candidate failed in Part II would be able to feel that he had been "downed" by potential business competitors.

Yours, etc.,

394, Albert Street, Eastern Hill, C.2, Melbourne.
April 28, 1948.

MARY THORNTON.

MORTALITY FROM ACUTE APPENDICITIS.

SIR: It would indeed be of interest, as stated in "Current Comment", to examine the Australian results of mortality from acute appendicitis. It would be well also to examine morbidity. There is ample evidence to show that there has been a very appreciable decline in mortality, but little to explain the difference in results obtained in the very few series of cases published—namely, from the mortality of nil in Dr. Kinsella's series to the highest mortality noted in "Current Comment". The figures in the Queensland Year Book for 1946 show the mortality from appendicitis in 1945 to have been:

Cause of Death.	Age at Death. (Years.)								
	0 to 9	10 to 19	20 to 29	30 to 39	40 to 49	50 to 59	60 to 69	70 or Over.	Total.
Appendicitis ..	7	10	3	7	7	9	12	6	61

Unfortunately the Year Book gives no indication of the case mortality.

Should a survey of the kind suggested be undertaken, there are several aspects of the problem which require special emphasis:

1. The present practice as regards drainage. Very little has been published in Australian medical journals on this question since the appearance of Sir Alan Newton's article some years ago.

2. To what extent is intestinal drainage by the Miller-Abbott tube used in hospitals in Australia?

3. To what extent is the Fowler position used?

4. What is the incidence of thrombosis and embolism, and what methods are used to prevent their occurrence?

5. The evolution of a method of recording that will ensure accuracy in comparison of results of treatment.

Yours, etc.,

E. S. MEYERS.

The University of Queensland Medical School,
Herston Road,
Brisbane, N.1.
April 30, 1948.

THE MEETING OF THE FEDERAL COUNCIL.

SIR: Several of the items mentioned in the report of the recent meeting of the Federal Council, and in the editorial in the journal of May 1, 1948, are very closely related. They are: a full-time secretariat, the appointment of an executive subcommittee, Dr. Simmons's proposal for diennial conferences, and the President's observation on the possibility of the arrangement of something analogous to the parent body's Representative Meeting.

These are all matters of organization, which, as stated in the editorial, should be of interest to every Branch member. This will only be likely if each member has a greater share in the management of the affairs of the Association.

At the 1934 meeting of the Federal Council at Hobart the Queensland proposal for the formation of a representative body was not adopted by the Council.

It is satisfactory to note that Sir Henry Newland is reviving the suggestion. It would appear that the Federal Council as at present constituted is too small to be a truly representative body and too large to be an executive committee.

When the original proposal for the formation of a Federal Council with a full-time secretariat was brought forward by the Queensland Branch, it was thought that the Federal Government would control all the public health services, and that in that event a large part of the time of a permanent secretary should be spent in Canberra. However, as the future relationship of the Federal and State Governments in health matters is still unknown, the arguments advanced for the immediate establishment of a full-time secretariat do not appear to be very convincing.

Yours, etc.,

E. S. MEYERS.

639, New Sandgate Road,
Clayfield,
Brisbane.
May 11, 1948.

ANNE MACKENZIE ORATION: HUNTER'S ADVICE TO JENNER.

SIR: In your issue of May 8 a correspondent writes objecting to repetition of what he calls "a false though attractive story". This statement is based on my quotation from correspondence between John Hunter and Jenner.

It is always wise to follow the advice "Always verify your references", and when I first read your correspondent's letter I thought that this was another occasion when I might have slipped through not having followed such advice, as it was over forty years since I first saw the quotation, though I have heard it frequently in various forms since. I remember that the first time I read it I was so struck with it that I have used it repeatedly since then. Therefore, last night I turned up "The Life of John Hunter", by Stephen Paget, in the "Masters of Medicine" series. The introduction is written by Sir James Paget, who says of Hunter:

> He saw the right method, and when he wanted to teach it he told it in words, quoted in Baron's Life of Jenner, "Don't think, try; be patient, be accurate"; plain words still useful in the whole range of medicine and of knowledge relating to it. We may believe that in what he read and what he heard in conversation with most of the leading medical men of his time, it was evident that they thought they could make what they believed to be knowledge more nearly complete, and more accurate, by "thinking" over what they already believed they knew to be true and fit to be expressed in "General Principles". But the facts were rarely quite true; the general principles deduced from them were still more rarely true or safe for further guidance.
>
> Hunter's rule may be well used in the promotion of all science. It so often seems safe to believe that by careful thinking over the facts already found and even repeatedly tested and confirmed, we may be able to think of others which appear naturally to follow them, and thus, by thinking, to enlarge our knowledge. But the history of science may teach that this is rarely safe; and that every "thinking" must be "tried" patiently and carefully, by experiment or repeated careful observation, before it can be safely accepted as truth. Hunter held by this rule. He did indeed think; he spent long times in only thinking; but we may believe that in many of these long times his conclusion was that in thus thinking he was tempting himself to the wrong way, and that, at most, it could only suggest how he should patiently and carefully "try" what he had been led to think. Thus at least we may test his writings, and much of his museum work. The same may be held now; facts are more numerous, and more nearly fully known; but few are even now so complete as to be safe for generalizing, and so it must yet be for a long time in all the divisions of medical science. The surety of every belief can only be sure after it has been "tried" by experiment or further observation.

It will be seen that Sir James Paget takes the quotation from Baron's "Life of Jenner" and reads into it quite a different meaning from your correspondent. If the latter reads a letter from Hunter to Jenner quoted in this biography he will see that Hunter says: "I thank you for your experiment on the hedgehog; but why do you ask me a question by the way of solving it? I think your solution is just; but why think? Why not try the experiment? Repeat all the experiments upon a hedgehog as soon as you receive this, and they will give you the solution . . . and let me know the result of the whole."

In the article on John Hunter in "The Harley Street Calendar", by H. H. Bashford, the author quotes from this letter and says: "If the gospel of Hunter could be put in eight words, there it stands in this letter to Jenner."

That was the point of the quotation, that the spirit of John Hunter was that of experiment rather than reflection. I am sorry that your correspondent, in his zeal for correct quotation, should miss the spirit behind the quotation.

Yours, etc.,

FRANK S. HONE.

Verco Buildings,
North Terrace,
Adelaide.
May 14, 1948.

DIAGNOSIS OF GASTRIC DISEASE: SHOULD RADIOLOGY OF THE STOMACH BE ABANDONED?

SIR: In the journal of May 15 appears an article by Dr. Kinsella entitled "Diagnosis of Gastric Disease: Should Radiology be Abandoned?".

I do not think the radiological examination in gastric disease should be abolished. It would be very unwise to do away with a method which in American clinics gives 95% of correct results. These results are reported from clinics where almost perfect follow-up methods are in use. I should think that at least a 90% result is obtained in Australia by experienced radiologists.

Here it is extremely difficult to get clinicians to notify the radiologist of the later case history. For years I had slips attached to report sheets, asking for follow-up details, but I failed to get a 5% response. I agree wholeheartedly that the clinician and the radiologist should work in closer cooperation. At present it is unusual to receive an adequate history—in fact, a great number of cases have received no meticulous examination, but are referred on mentioning that they have indigestion.

The recumbent position is most important, but unfortunately many cardiac-end carcinomata are of the "flat" type and give no deformity of gastric outline.

Hiatus herniæ are quite common and can usually be detected by preliminary screening. I totally disagree with Dr. Kinsella's statement that "such a condition is dangerous and requires early surgical attention". I have seen dozens of these conditions including herniation of the whole of the small intestine and most of the colon, and I have never seen one which called for surgical intervention. Many of these cases have been seen periodically for twenty to thirty years, and their only complaint has been occasional dyspeptic symptoms.

Some of the cases of carcinoma illustrated by Dr. Kinsella should have shown loss of peristalsis, which should have led to a request by the radiologist for a repeat examination.

Dr. Kinsella states that one of the cases of carcinoma might have been revealed two years previously. I doubt if carcinoma lasts two years without the gravest symptoms, unless of the slow-growing scirrhous type.

In conclusion I do not think that Dr. Kinsella has made out a case for the abandonment of radiology, but gather from his remarks that the radiologist should be replaced by that unusual person—the radiological clinician.

Yours, etc.,

185, Macquarie Street, Sydney, J. G. EDWARDS.

May 17, 1948.

SIR: I wish to reply to the paper by Mr. V. J. Kinsella entitled "Diagnosis of Gastric Disease: Should Radiology of the Stomach be Abandoned?", dated May 15, 1948.

This title would seem to be more sensational than scientific, although it is not a new viewpoint and was suggested many years ago by Mautier quoted by Schindler, who did not agree with this viewpoint despite his own advocacy of gastroscopy. This has never received any serious attention, however, and more and more intestinal radiology is carried on every year in all the world centres.

On consideration of the paper one finds that, far from suggesting the abandonment of radiology, the author concerns himself with it most minutely and even attempts to give directions as to how gastric radiology should be performed and does not even mention the importance of gastroscopy which most radiologists feel is a necessary corollary to radiology in many cases. The author then states that clinical considerations should be paramount in the diagnosis of gastric cancer, but this is surely merely a medical platitude and is a point which is stressed in all surgical textbooks. Maingot in his "Post-Graduate Surgery" states: "Negative X-ray findings do not prove the absence of malignant growth nor should a decision as to operability be based solely upon radiological findings." It would therefore appear that in case F.McG., who had "symptoms typical of advanced carcinoma of the stomach", it was the clinician in this case and no doubt in most of the other cases mentioned who was blameworthy for not undertaking exploratory laparotomy or gastroscopy, and it is quite unjustifiable to attempt to lay the blame on the radiologist who merely gives a report on what he can see in an organ and does not in any way insist that this excluded every possible lesion. Mr. Kinsella then goes on to list a number of cases, in all of which the radiologist is held up as the scapegoat. These cases can be placed in two categories.

1. Cases in which the radiologist undoubtedly was in error, and this is apparent in skiagrams such as Figure XII. There is, of course, no excuse for errors of this kind, but one can reflect that radiologists are not the only fallible members of the medical profession, although other branches have not so far had the dubious honour of having a biographer of their mistakes who has carefully cherished their errors and then classified, collected and published them together with the comment that some of them are "amusing".

2. Cases in which it would appear highly probable that the eventual result of the case has been read into the original skiagrams. For instance, in Figures VI and VII, although no doubt a carcinoma was eventually proved to be present, there is nothing in the reproduced skiagrams to suggest any pathology. "After the event" diagnoses are, of course, simple, but the radiologist has the difficult task of expressing an opinion on an organ which presents many different normal variations in size, position and mucosal pattern, and if slight variations in any of these were made the basis of diagnosing cancer then gastric radiology would not hold the place which it does today.

Mr. Kinsella then goes on to state that K. C. Clark in her "Positioning in Radiology" mentions certain positions which may not always be used by radiologists; it should be realized, however, that Miss Clark is a lay person who has prepared this book primarily for technicians in order that they may be able to carry out any examination required by the radiologist, and she lists twenty (20) different positions for radiography of the skull, but they could hardly all be used on the one patient. In similar vein Templeton, of Chicago, is quoted and a number of X-ray positions recommended by him are mentioned, but Templeton also states:

> It is not necessary for a roentgenologist to perform all the various tricks at his command or to record on films all the segments of the esophagus, stomach and duodenum seen in the numerous positions necessary to rule out every possible lesion. To do so exposes both the roentgenologist and the patient to an undue amount of radiation and is fatiguing to the examiner.

Finally it is suggested that the clinician should assume the role of radiological director who would convert the qualified radiologist into a technician. However, when a patient comes to the radiologist he becomes his patient for the time being, and the radiologist is both morally and legally responsible for the examination, and he also has to decide how to expend the strictly limited time which is available for fluoroscopy without endangering the patient; and the way in which the clinician can best assist him is by giving him relevant details of the physical examination and history, so that he may direct his maximum attention to those parts most deserving of suspicion.

In conclusion I would say that, if Mr. Kinsella succeeds in causing a renewed interest in the difficult problem of early diagnosis of gastric carcinoma and if he can stimulate both clinician and radiologist to greater efforts, then his paper must be regarded as having justified its publication; and I trust that it will have this effect and that it will not cause the clinician to distrust the radiologist and either to defer X-ray examinations of the stomach or to attempt to direct the technical side of the examination, which I feel sure was not the intention of the author.

Yours, etc.,

159, Macquarie Street, Sydney, GEOFFREY HAGARTY.

May 18, 1948.

SIR: I have read Dr. Kinsella's article in your last issue with a blend of resentment and approval.

His main thesis that radiology, as a profession, is fully dependent upon clinical practice and guidance will be accepted and even commended by every competent radiologist. We are the hand-maidens to clinical effort and welcome any attempt to instruct us in current clinical requirements, reserving to ourselves, however, the right to direct and decide our own peculiar technical procedures. The real trouble is that we seldom receive the guidance we rightly expect, and on that count alone I am glad this article was written.

Though laudable, such a thesis is not new to radiologists, and if I may be pardoned the egotism, I would refer Dr. Kinsella to an article on "The Clinical Nature of Radiology" published in your 1936 pages, wherein the virtues of this attitude are fully considered from the radiological viewpoint.

But, granting Dr. Kinsella's fundamentals, professional pride impels me to contradict some of his erroneous conclusions.

The backbone of the essay is a series of clinical histories, all awful examples of the radiologist's lapses in his less coherent moments. In the first place, such a method, inevitable though it is for such a purpose, is intrinsically unfair to use as a basis for wholesale condemnation, for it totally neglects the radiologists' well-known successes.

Secondly, all of these histories are selected and traced backwards from the damning consummation, after the event, to the point where the minimal sign is just discernible and the finger of scorn is then directed at the radiologist who missed the incipient disease. This unhappy wretch, however, had to work the other way, from the normal towards the borderlands of the normal, a much more difficult procedure than a backward reconstruction.

I venture to suggest that the achievements of the most eminent physician, analysed in this way, would appear even more disastrous.

It is easy to criticize the radiologist. He is a ubiquitous specialist who serves almost every branch of medicine. He has to deal, not with the technically ignorant laity, who ask only for a good bedside manner, but with an instructed and critical profession. Furthermore he courageously writes his opinions in black and white and inescapably commits himself, thus placing his neck upon the block for the often inevitable stroke.

No radiologist ever claims that his negative findings always exclude disease or that they always reveal it when present. Dr. Kinsella has discovered what every clinician should know and what every radiologist does know, that X-ray methods have definite thresholds of error and cannot, in spite of professional expectations, produce a diagnostic rabbit out of the hat every time.

Our thanks are due to Dr. Kinsella for emphasizing this to his fellow clinicians.

Apart from that, such an article serves a doubly useful purpose, jogging the radiologist out of his complacency and emphasizing the very sound principle of cooperation with the clinician, and after all, we certainly learn more from the survey of our errors than from the recital of our praises. But we are really not such poor creatures of error as Dr. Kinsella makes out, nor do I really think he really thinks

so. As ever, the radiologist takes the jibe for his lapses, but on the whole keeps on keeping the clinician in the paths of diagnostic rectitude with very fair success.

Of course we sometimes get tired or lazy or careless and overworked. But then, who does not?

Yours, etc.,

137, Macquarie Street, Sydney,
May 21, 1948.

ERIC W. FRECKER.

Naval, Military and Air Force.

APPOINTMENTS.

THE undermentioned appointments, changes *et cetera* have been promulgated in the *Commonwealth of Australia Gazette*, Number 79, of May 20, 1948.

CITIZEN NAVAL FORCES OF THE COMMONWEALTH.

Royal Australian Naval Volunteer Reserve.

Appointment.—Keith Campbell Bradley is appointed Surgeon Lieutenant, with seniority in rank of 27th January, 1942, dated 26th September, 1946.

Termination of Appointment.—The appointment of Sinclair Elwyn Finlay as Surgeon Lieutenant is terminated, dated 21st November, 1945.—(Ex. Min. No. 34—Approved 14th May, 1948.)

AUSTRALIAN MILITARY FORCES.

Interim Army.

Australian Army Medical Corps.

SX34387 Captain J. S. Skipper is transferred to the Reserve of Officers (Australian Army Medical Corps) (4th Military District), 13th March, 1948.

130th General Hospital: To be Temporary Major, 5th February, 1948.—NX506297 Captain J. Prior.

16th Camp Hospital.—Captains NX208032 W. J. Cathers and NX208033 A. B. Conomy are transferred to the Reserve of Officers (Australian Army Medical Corps) (2nd Military District), 13th March, 1948, and 16th March, 1948, respectively.

Reserve Citizen Military Forces.

Australian Army Medical Corps.

1st Military District.—The notification respecting Major C. R. Morton which appeared in Executive Minute No. 181 of 1947, promulgated in *Commonwealth Gazette* No. 241 of 1947, is withdrawn.

6th Military District.—The following officers are placed upon the Retired List (6th Military District) with permission to retain their rank and wear the prescribed uniform, 10th March, 1948: Major F. W. Fay, M.C., and Honorary Major A. Pryde.

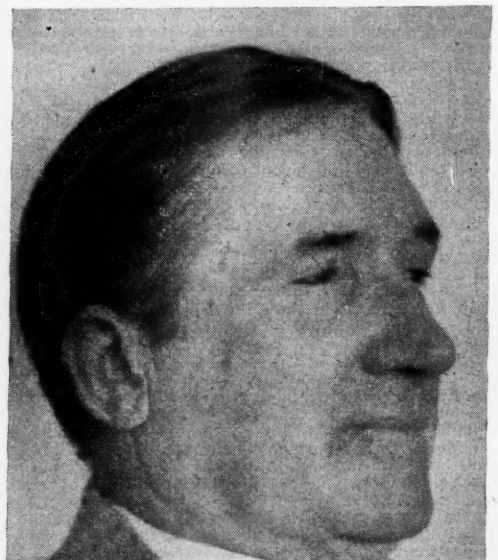
Obituary.

HERBERT HUFF JOHNSTON.

WE are indebted to Dr. F. G. N. Stephens for the following appreciation of the late Dr. Herbert Huff Johnston.

It was with a feeling of personal loss that his friends, whether colleagues or patients, heard of the death of the late Dr. Herbert Huff Johnston. This, after weeks of suffering, took place at the Scottish Hospital in surroundings which had always been congenial to him. As a child he lived at Petrolea in Canada, a fact which later enabled his American colleagues to claim that he was "an American" and thus render possible a difficult escape from Austria in the latter part of 1914, though this was only after great privations. In point of fact his family migrated to Australia when he was but a little child; and a very good Australian he was, firstly at Bourke, and then from 1898 at Newington College where he founded many of those close friendships that were to prove so comfortable and enduring for the rest of his life.

Newington was dear to him; he was ever an effective member of the Old Boys' Union, as the library and a scholarship, endowed in memory of his mother, so clearly show. He entered on his medical studies at the University of Sydney, and, after a successful course during which he forged enduring links with those who were to work beside him in after years, graduated in 1908. Shortly afterwards he became junior resident medical officer at Callan Park Hospital, and in due course a senior resident till 1913, when he decided to make a break from this type of work and to specialize in diseases of the ear, nose and throat. To this end he entered into residence at Gray's Inn Road Hospital in London, later leaving this centre to pursue his studies further at Vienna, until the outbreak of World War I caused their sudden and unpleasant termination as already described. He then returned to Sydney only to be laid aside by an illness which caused a temporary cessation of his professional activities; this was cheerfully faced and used as a golden opportunity to read and review a number of medical works and thus further to enrich not only his knowledge but also his character. The rest of his career



as a specialist in this city is well known in its understanding, its friendliness and the high level of skill and conscientiousness therein manifested.

His was indeed a busy life, for he held the positions of ear, nose and throat surgeon, till shortly before his death, at the Royal Alexandra Hospital for Children, the Prince Henry Hospital, and the Royal South Sydney Hospital. These, however, were but a few of his activities, for he gave his services most freely to the Barnardo Homes, the Far West Children's Health Scheme, the Home for Incurables, the Salvation Army, the Blind Institute and the Methodist Conference.

In conclusion all who knew him sympathize very deeply with Mrs. Johnston and the family in their sorrow.

Dr. H. R. R. Grieve writes: These columns carried a few months ago the announcement of the death of Herbert Huff Johnston, of Sydney. It is meet that witness should be borne to his worth. In modern France it is resolved of singularly great citizens, *Il a bien mérité de la République.* If ever a man could be said to have merited well of the true democracy of medicine, of patients and fellow doctors, it would be Huff Johnston. No more lovable or beloved doctor practised medicine in this generation of ours.

He was one of those rare men who can neither think nor do aught but good. Of the good things which are naturally within the power and opportunity of a doctor to do, he did

legion. He had but to be told a history indicating danger or suffering and his humanity overruled all thought of the strain of the heavy day past and of the equally heavy morrow. Either he never conceived idea of reward or, if he did, ignored it. He loved his work and he instinctively loved all living things. In him there were great courage in a difficulty, sweet modesty and humility, a sort of gentle nobility and a measure of the culture now, alas, too seldom discovered in the practising doctor.

What an influence he was to the delightful family one would expect him to have and what a consolation to a friend can only be conjectured. In a life's journey there will have been few Huff Johnstons, for he was indeed "a verray parfit, gentil knight".

HUGH CORBETT TAYLOR-YOUNG.

WE regret to announce the death of Dr. Hugh Corbett Taylor-Young, which occurred on May 20, 1948, at Red House, Park Lane, Salisbury, England.

RICHARD RYTHER POPPLEWELL STEER BOWKER.

WE regret to announce the death of Dr. Richard Ryther Popplewell Steer Bowker, which occurred on May 28, 1948, at Croydon, New South Wales.

VINCENT WELLESLEY SAVAGE.

WE regret to announce the death of Dr. Vincent Wellesley Savage, which occurred on May 31, 1948, at Wellington, New South Wales.

A MEMORIAL TO DR. VERA SCANTLEBURY BROWN.

DR. VERA SCANTLEBURY BROWN, O.B.E., who died on July 14, 1946; had been Director of Maternal, Infant and Pre-School Welfare in Victoria for twenty years. During this period she dedicated herself to the task of organizing and developing the child welfare services of the State, and it is largely owing to her efforts that official, professional and public opinion throughout Australia has realized the necessity for maintaining and extending the care of mothers, infants and pre-school children. A Memorial Appeal Committee was constituted at a public meeting held in the Melbourne Town Hall on November 29, 1946, Lady Herring being elected president. The committee decided to found, as a memorial to Dr. Scantlebury Brown, a scholarship fund of £25,000, from the income of which would be provided each year a travelling scholarship of the value of £750; this scholarship would be awarded to infant welfare nurses, women medical practitioners and pre-school (kindergarten) personnel, in rotation. Delays have been inevitable, but gifts amounting to over £3500 have been received, including specific sums sufficient to allow the first three scholarships to be awarded. The first scholarship has been awarded to a nurse, and it is proposed to award the next scholarship to a medical practitioner. The committee is anxious that the corpus of the fund should be subscribed as soon as possible, and believes that medical practitioners in States other than Victoria may wish to subscribe to it. Cheques should be made payable to the Scantlebury Brown Memorial. The office of the committee is at the Lord Mayor's Fund, 243, Collins Street, Melbourne, C.1.

The Royal Australasian College of Surgeons.

A POST-GRADUATE COURSE IN SURGERY.

THE Royal Australasian College of Surgeons will conduct in Melbourne a post-graduate course in surgery. It will begin on Monday, August 30, 1948, and will cover a period of approximately thirteen weeks. The course is suitable for all graduates who wish to undertake post-graduate study in surgery, and it is not designed solely for those desiring to present themselves for senior surgical qualifications.

Lectures and lecture-demonstrations will be arranged in the surgical specialties. These will be announced in detail following the receipt of entries, which close on July 31, 1948. Lectures and lecture-demonstrations in pathology will also be arranged. A detailed syllabus will be available in due course.

GORDON CRAIG SCHOLARSHIPS.

THE Council of the Royal Australasian College of Surgeons invites applications for the fifth award of Gordon Craig scholarships.

1. These scholarships are awarded for the purpose of furthering post-graduate education in surgery and surgical research.

2. Favourable consideration will be given to applicants who intend to present themselves for a senior surgical qualification.

3. Applicants must have been qualified for at least two years.

4. Scholarship holders will be required to carry out whole-time duty at a medical school or research institute or hospital or at two or more of these, although this condition may be varied in exceptional cases.

5. The amount of each scholarship will be at the discretion of the College, but the College is prepared to grant up to £400 a year to suitable applicants.

6. Forms of application, together with details of the regulations governing the award of the scholarships, are available from the secretary of the Royal Australasian College of Surgeons, Spring Street, Melbourne.

7. Applications should be lodged with the secretary and reach him not later than January 31, 1949.

Australian Medical Board Proceedings.

NEW SOUTH WALES.

THE undermentioned have been registered, pursuant to the provisions of the *Medical Practitioners Act*, 1938-1939, of New South Wales, as duly qualified medical practitioners:

Brown, Alan Belfield, M.B., B.S., 1947 (Univ. Sydney), District Hospital, Broken Hill.

Burke, Nora Teresa, M.B., B.S., 1947 (Univ. Sydney), Queen Victoria Hospital, Melbourne, Victoria.

Byrne, Kevin Edward Geoffrey, M.B., B.S., 1947 (Univ. Sydney), Lewisham Hospital, Lewisham.

Clarke, Arthur John Robert, M.B., B.S., 1947 (Univ. Sydney), Maitland Hospital, West Maitland.

Connolly, John James, M.B., B.S., 1947 (Univ. Sydney), 41, Tupper Street, Marrickville.

Degotardi, John Charles, M.B., B.S., 1947 (Univ. Sydney), Public Hospital, Rockhampton.

Deithe, Noel Harold Ross, M.B., B.S., 1947 (Univ. Sydney), District Hospital, Lithgow.

Dent, John Arthur Sherbon, M.B., B.S., 1947 (Univ. Sydney), Western Suburbs Hospital, Croydon.

Dunkley, Brian Hiatt, M.B., B.S., 1947 (Univ. Sydney), Ryde District Hospital, Eastwood.

Egan, James Edward, M.B., B.S., 1947 (Univ. Sydney), District Hospital, Cessnock.

Elton, Bruce Frederick, M.B., B.S., 1947 (Univ. Sydney), District Hospital, Canterbury.

Evans, Jack Lewis, M.B., B.S., 1947 (Univ. Sydney), Base Hospital, Dubbo.

Fewell, Dorothy Grace, M.B., B.S., 1947 (Univ. Sydney), 26, Rickard Road, South Hurstville.

Fitzhenry, June Snowden, M.B., 1947 (Univ. Sydney), Wallumbilla Hospital, via Roma, Queensland.

Freilich, Herbert, M.B., B.S., 1947 (Univ. Sydney), Base Hospital, Tamworth.

Gray, Geoffrey George, M.B., B.S., 1947 (Univ. Sydney), 5, Alison Road, Kensington.

Hodgson, John Hargraves, M.B., B.S., 1947 (Univ. Sydney), Base Hospital, Tamworth.

Hull, John Poole, M.B., B.S., 1947 (Univ. Sydney), District Hospital, Parramatta.

Jensen, Frederick Alfred Soren, M.B., B.S., 1947 (Univ. Sydney), 69, Yarranabbe Road, Darling Point.

Kellow, Henry Edward, M.B., B.S., 1947 (Univ. Sydney), Maitland Hospital, West Maitland.

Knowles, Robert Raymond, M.B., B.S., 1947 (Univ. Sydney), Tullamore.

Lachlan, William John, M.B., B.S., 1947 (Univ. Sydney), Royal Prince Alfred Hospital, Camperdown.
Luke, Clifton James Herbert, M.B., 1947 (Univ. Sydney), Cairns Hospital, Cairns, Queensland.
Lyall, John Angus, M.B., 1947 (Univ. Sydney), c.o. Dr. H. S. Thomas, Captain's Flat.
Macaulay, Amy Flora Jessie, M.B., B.S., 1947 (Univ. Sydney), 19, Pemberton Street, Parramatta.
McAuliffe, Peter Cornelius, M.B., B.S., 1947 (Univ. Sydney), Mater Misericordiæ Hospital, North Sydney.
McLachlan, Keith Roland, M.B., B.S., 1947 (Univ. Sydney), Base Hospital, Lismore.
Matheson-Lines, Murdoch, M.B., B.S., 1947 (Univ. Sydney), Base Hospital, Wagga Wagga.
Oliver, John, M.B., B.S., 1947 (Univ. Sydney), Sydney Hospital, Sydney.
O'Loan, John, M.B., B.S., 1947 (Univ. Sydney), Mater Misericordiæ Hospital, Waratah.

QUEENSLAND.

THE undermentioned has been registered, pursuant to the provisions of *The Medical Acts*, 1939 *to* 1946, of Queensland, as a duly qualified medical practitioner:

Middleton, Peter Guy, M.B., B.S., 1943 (Univ. Sydney), Base Hospital, Maryborough.

Nominations and Elections.

THE undermentioned have applied for election as members of the New South Wales Branch of the British Medical Association:

Messent, Derrick Orry Hunt, M.B., 1946 (Univ. Sydney), Grosmere, 57, Derby Street, Watson's Bay.
Murray-Jones, Judith, M.B., B.S., 1947 (Univ. Sydney), Royal North Shore Hospital, Crow's Nest.

Medical Appointments.

Dr. Phyllis M. Tewsley has been appointed Superintendent of the Royal Park Reformatory School for Boys (Receiving Depot) and Matron of the Royal Park Reformatory School for Girls (Receiving Depot), pursuant to the provisions of section 330 of the *Crimes Act*, 1928, of Victoria.

Dr. G. P. Hildebrand has been appointed Government Medical Officer at Atherton, Queensland.

Dr. F. W. R. Lukin has been appointed a member of the Medical Board of Queensland, in pursuance of the provisions of *The Medical Acts*, 1939 *to* 1946, of Queensland.

Dr. J. I. Tonge, Acting Director, Laboratory of Microbiology and Pathology, has been appointed Director, Laboratory of Microbiology and Pathology, in pursuance of the provisions of the *Public Service Acts*, 1922 *to* 1945, and *The Health Acts*, 1937 *to* 1946, of Queensland.

Books Received.

"Diseases of the Chest: Described for Students and Practitioners", by Robert Coope, M.D., B.Sc., F.R.C.P., with a Foreword by Lord Horder; Second Edition; 1948. Edinburgh: E. and S. Livingstone, Limited. 8½" x 5½", pp. 558, with illustrations, some of them coloured. Price: 25s.

"An Introduction to Physical Methods of Treatment in Psychiatry", by William Sargant, M.A., M.B. (Cantab.), M.R.C.P., D.P.M., and Eliot Slater, M.A., M.D. (Cantab.), F.R.C.P., D.P.M., with a chapter on treatment of the epilepsies by Denis Hill, M.B. (London), M.R.C.P., D.P.M.; Second Edition; 1948. Edinburgh: E. and S. Livingstone, Limited. 8½" x 5½", pp. 232. Price: 10s. 6d.

"The Universe in the Making: A Biochemical Approach", by J. E. R. McDonagh, F.R.C.S.; 1948. London: Chaterson, Limited. 7¾" x 5", pp. 184. Price. 7s. 6d.

"Basic Facts of Health Education: For Members of the Medical, Pharmaceutical and Nursing Professions", selected articles from the Ministry of Health Bulletins which have appeared in *The Pharmaceutical Journal*, 1944-1947; 1948. London: The Pharmaceutical Press. 8½" x 5½", pp. 200. Price: 7s. 6d.

"Tuberculosis in the Commonwealth, 1947", Complete Transactions of the Commonwealth and Empire Health and Tuberculosis Conference; 1947. London. 8½" x 5½", pp. 336. Price: 15s.

"Clinical Endocrinology and Constitutional Medicine", by A. P. Cawadias, O.B.E., M.D., F.R.C.P.; 1947. London: Frederick Muller, Limited. 9½" x 6¼", pp. 380, with illustrations. Price: 42s.

Diary for the Month.

JUNE 14.—Victorian Branch, B.M.A.: Finance, House and Library Subcommittee.
JUNE 15.—New South Wales Branch, B.M.A.: Medical Politics Committee.
JUNE 16.—Western Australian Branch, B.M.A.: General Meeting.
JUNE 17.—New South Wales Branch, B.M.A.: Clinical Meeting.
JUNE 17.—Victorian Branch, B.M.A.: Executive Meeting.
JUNE 22.—New South Wales Branch, B.M.A.: Ethics Committee.
JUNE 23.—South Australian Branch, B.M.A.: Annual Meeting.
JUNE 23.—Victorian Branch, B.M.A.: Council Meeting.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Honorary Secretary, 135, Macquarie Street, Sydney): Australian Natives' Association; Ashfield and District United Friendly Societies' Dispensary; Balmain United Friendly Societies' Dispensary; Leichhardt and Petersham United Friendly Societies' Dispensary; Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney; North Sydney Friendly Societies' Dispensary Limited; People's Prudential Assurance Company Limited; Phœnix Mutual Provident Society.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federated Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute; Brisbane City Council (Medical Officer of Health). Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178, North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205, Saint George's Terrace, Perth): Wiluna Hospital; all Contract Practice appointments in Western Australia. All government appointments with the exception of those of the Department of Public Health.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

All communications should be addressed to the Editor, THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, New South Wales. (Telephones: MW 2651-2.)

Members and subscribers are requested to notify the Manager, THE MEDICAL JOURNAL OF AUSTRALIA, Seamer Street, Glebe, New South Wales, without delay, of any irregularity in the delivery of this journal. The management cannot accept any responsibility or recognize any claim arising out of non-receipt of journals unless such notification is received within one month.

SUBSCRIPTION RATES.—Medical students and others not receiving THE MEDICAL JOURNAL OF AUSTRALIA in virtue of membership of the Branches of the British Medical Association in the Commonwealth can become subscribers to the journal by applying to the Manager or through the usual agents and booksellers. Subscriptions can commence at the beginning of any quarter and are renewable on December 31. The rates are £1 for Australia and £2 5s. abroad *per annum* payable in advance.